

**PRODUCTIVE AND SUCCESSFUL VIRTUAL TEAMS: AN ANALYSIS
OF TRUST AND COLLABORATION**

by

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Abstract

There are countless ways of attracting and linking people to the benefits of virtual team relations, and the numerous opportunities associated with them. Among these ways is the development of trust and collaboration, which are essential elements in developing and maintaining any relationship. Simply stated, both long-term and short-term interaction between various parties can be established and effectively developed through a wide array of savvy, trust and collaboration building relational methods. When these methods are used properly, they can be very effective and reinforcing in inviting and growing ongoing virtual team relationships. Thus, trust, collaboration, and relationship-building strategies can ultimately serve to create a rewarding, win-win situation for all parties involved. This dissertation discusses and presents an analysis of the critical elements of trust and collaboration in virtual teams. In addition, the study highlights the competencies that effectively act to bring people together in virtual teams as well as invite positive interpersonal interaction among the parties involved. The research was conducted using a quantitative survey methodology in order to access and compare the business professional's input regarding their current knowledge and perceptions associated with the factors of trust and collaboration in virtual teams. This descriptive research study used a systems approach with a descriptive correlational design to examine and compare the relationships between trust, collaboration, and perceived productivity, and success in a virtual team context. This research study serves as a foundational work for exploring the relationships of trust and collaboration and their perceived influence on productivity and success in geographically dispersed teams.

Dedication

My dissertation is dedicated to my sons Gregory and Grant Cook. May this serve throughout your life as evidence that anything can be achieved if you work hard, stay with it, and strive for accomplishing your goals and making your dreams come true.

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CHAPTER 1. INTRODUCTION

Introduction to the Problem

In 2002 it was acknowledged that virtual teams have been developed as an effective tool in workplace environments. Subsequently, the movement toward virtual teams is on the increase (Armstrong & Cole, 2002; Zolin & Hinds, 2002). New territory for working collectively apart has been created by distance spanning communication technologies. As a result, international teamwork has become an everyday reality (Kezsbom, 2000). In addition, business environments are being transformed by the application of the virtual settings and the employment of virtual teaming. These platforms for interaction enable people to participate and collaborate from all corners of the globe at any time of the day or night (McFadzean, 2001).

Due to new pressures facing businesses and organizations worldwide, many firms are incorporating the use of virtual teams. The integration of virtual teams allows new ways of processing, structuring, and distributing communication, and work activities in order to overcome the boundaries of space and time (Tocci, 2003). Workers interacting in a virtual environment are the result of the increasing numbers of workers that are no longer co-located with their team members. These team members are capitalizing on technology to communicate, provide advantages to projects, and to meet both team and organizational objectives. Team members can be, and often are, located in multiple geographic regions because ubiquitous nature of technology (Howard, 2004).

Globalization, technology, and the requirement to transfer information at the speed of light according to Lucas (2007), have necessitated the creation of a new organizational paradigm called virtual teams (Solomon, 2001). Being virtual in the majority of situations is not a strategy; instead it is an operational reality. Hence, the decision to use a virtual team is frequently not a choice, but a necessity (Clayden, 2007; Gassman & Zedtwitz, 2003). Additionally, the establishment of virtual teams can bring considerable benefits and offer numerous advantages to these teams (Albertson, 2009). Although virtual teams offer a countless number of benefits, the virtual environment also presents many potential pitfalls and challenges (Arnold, 2008).

Background of the Study

The contemporary consensus in the year 2011 on virtual teams regards relationship building, cohesion, and trust as fundamental processes that foster team effectiveness, however virtual teams face tremendous difficulty in achieving them (Powell, Piccoli, & Ives, 2004). In the past few years, there have been several highly influential authors on virtual communities and through their groundwork they have provided a basis for future development and research on virtual teams (Albertson, 2009; Arnold, 2008; Clayden, 2007; Fiedler, 2009; Hart, 2009; Herron, 2009; Kelley, 2009; LaBelle, 2008; Ngo-Mai & Raybaut, 2007; Siebdrat, Hoegl & Ernst, 2009; Smith, 2008; Tseng, 2008; & Xiong, 2009). Their research and contributions have illuminated the key factors in creating successful virtual communities and the critical areas for their development. A review of virtual team literature also reveals critical gaps in the virtual team literature in regards to research on the relationship between the constructs of trust and collaboration in a virtual context.

A significant trend affecting the rapid growth of geographically dispersed teams is globalization (Xiong, 2009). More and more organizations are beginning to organize their projects over distance. These virtual teams are increasingly made up of professional people of different cultures who commonly are located in geographically dispersed locations. Prior research points out that even minute degrees of dispersion can greatly influence the quality of collaboration in a team (Siebdrat, Hoegl & Ernst, 2009).

Virtual teams have become a standard of global and domestic business; however, one of the most significant issues confronting virtual work groups is trust. The necessity to work with others through a text-based online environment can make trust issues all the more significant. In these virtual settings, the diminishment of physical cues serves to only provide limited information for team members to utilize in order to assess trust. Moreover, the need to understand trust issues becomes fundamental as the use of online collaborative teams increases. Although trust is essential for virtual team success, the research yields contradictory results leaving researchers and practitioners with several unanswered questions associated with trust issues in virtual groups (Smith, 2008). The majority of studies on trust have focused little attention to monitoring how actual trust relations are grown and developed among virtual team members, over the course of time, and in an online collaborative environment (Tseng, 2008). Additionally, previous research studies show that trust is robustly related to effectiveness, however, the research stops short of establishing a relationship between trust and the perceived effectiveness of virtual teams (Hart, 2009).

Trust matters in a rapidly changing society; however, there is lack of research and an apparent deficiency in the literature on the construct of trust (Herron, 2009). A central

issue that faces every business organization is how employees and partners can be motivated to invest in trust and cooperation (Fiedler, 2009). The same is true in regards to collaboration in geographically dispersed virtual teams. The success of any virtual team's performance can contribute to the success of an individual or an organization's reputation, prestige, and bottom line (Kelley, 2009).

Working virtually has become very common in business and as a result it has facilitated the need to gain a better understanding of the factors that can influence a virtual team's success and productivity. This increase in virtual teaming makes it imperative for individuals and organizations to have a firm understanding of the factors that lead to high trusting teams as well as what factors might act as obstacles to its development (Hart, 2009).

Because, social and technological issues can have an impact on a virtual team's performance and success, it is important to gain a good understanding of them (Sorbel-Lojeski, 2006). A virtual team's performance is an important measure of its success; however, virtual team trust may be equally important to a team's success as well. Although studies on virtual teams are plentiful, there is a need for an investigation of the factors that enable them to be successful. Hence, there is a gap in the research knowledge on virtual team trust and performance (LaBelle, 2008). Therefore, a better understanding of the exact role and nature of these virtual communities is needed (Ngo-Mai & Raybaut, 2007).

Despite all of the literature on virtual teams, there have been few studies that have focused specifically on the constructs of trust and collaboration and their influence on productivity and success in geographically dispersed teams. While the virtual team body

of research continues to grow, relatively little is known about the effects of these factors on productivity and success in a virtual context. Although there has been a lot of research on the topic of virtual teams, there is a gap in what is known about trust and collaboration and their impact on virtual team relations. Therefore, what remains ambiguous is a complete understanding of the factors of trust and collaboration and their influence on virtual team success and productivity. Up to this point, few studies have focused specifically on the relationship between trust and collaboration in a virtual team context. Also, virtual team research is lacking investigation into the factors of trust and collaborations and their influence on success and productivity. The stream of virtual team research lacks data on the factors of trust and collaboration. Therefore, a quantitative analysis on the constructs of trust and collaboration in a virtual team context greatly adds to the understanding of how these variables or the lack of them affect success and productivity in virtual teams. This research was aimed to address the apparent gap in the current virtual team literature.

Additionally, due to this minimal research on trust and collaboration in virtual environments, there remained an opportunity to conduct an investigation to generate new knowledge on the topics. In addition, because of the increase in geographically dispersed virtual teams on a rise and the importance of the factors of trust and collaboration to increase the success and productivity of these teams, it was essential to discuss these topics in union.

This unrealized opportunity provided the basis for this study and an avenue for the contribution of valuable knowledge on the factors of trust and collaboration in virtual teams. Additionally, these findings may elevate awareness, interpretation, and

understanding of these factors and of virtual team relations. This research study addresses this gap by examining the influence of trust and collaboration in a virtual team context and from a business professional's perspective. Furthermore, the results of this descriptive correlation study are of particular interest, because to date there have been few studies that have specifically investigated the relationship between trust and collaboration and these constructs influence on the success and productivity of virtual teams.

Statement of the Problem

A primary problem in virtual communities is getting virtual team members to trust and collaborate with one another. This research addresses the lack of research on trust and collaboration in a virtual context and it investigates the perceived influence of these key relations factors on productivity and success of virtual teams.

Purpose of the Study

The purpose of this descriptive corrolational research study was to understand, explain, and predict the controlling relationships between variables in regards to trust and collaboration and their perceived influence on the productivity and success of virtual teams. In addition, the literature on virtual teams serves to affirm the lack of research on trust and collaboration in a virtual team context and therefore, affirms the relevance of this research. This study was chiefly motivated by the omnipresence of geographically dispersed virtual teams and the lack of knowledge associated with trust and collaboration in these online business teams. In order to understand this phenomenon a corrolational design method was utilized to investigate the different relationships. Additionally, this study was approached from both a business professional's and a virtual team member's

perspective using a quantitative survey methodology. The research investigates how the factors of trust and collaboration in geographically dispersed virtual teams impact the interaction between virtual team members and affect the perceived productivity and the success of these teams.

Rationale of Study

Through utilizing a descriptive correlational design and a quantitative methodology it can ultimately generate knowledge and understanding that may be utilized to explain and predict the controlling relationships between variables associated with virtual team interaction. Particularly in terms of understanding and explaining the factors of trust and collaboration associated with their influence on the productivity and success of virtual teams. In doing so, the data and understanding generated may provide a path for others to follow in their quests for optimum virtual team interactions and continued relations with their fellow team members, team leaders, and acquaintances.

The results and the analysis of this research study can also provide a greater awareness, understanding, and a base of knowledge regarding trust, collaboration, and relations between members of virtual teams so that others may be both productive and successful. Through illuminating the study's participant perceptions, understandings, and by extending the knowledge of trust and collaboration, it can serve to improve the perceived productivity and success in geographically dispersed virtual teams.

Furthermore, this study was accomplished in order to provide knowledge and understanding that may be helpful in explaining and predicting the relations between variables guiding others to be more trusting and to invite them to collaborate better in their business interactions and relations. A quantitative research methodology,

specifically correlation analysis can provide the statistical measures necessary to portray the relationships between the variables in the study. In addition, the data was collected and synthesized so that individuals and institutions can ultimately maximize their potential for success between their partners and in order to provide a basis for expansion of business opportunities. This data may also be of a high relevance to business firms seeking to implement virtual teams. This new data generated may also be empowering to virtual professionals enabling them to better trust, collaborate, and to be productive, and successful in the competitive global workplace.

Research Questions

The scope of the quantitative method research serves to understand, explain, and predict the relations among the variables of trust and collaboration associated with the perceived productivity and success of virtual teams. The following are the questions that are the basis of this research study:

1. What is the relationship between perceived trust in virtual teams and collaboration factors?
2. What is the relationship between perceived productivity in virtual teams and collaboration factors?
3. What is the relationship between perceived productivity in virtual teams and trust factors?
4. What is the relationship between perceived success in virtual teams and collaboration factors?
5. What is the relationship between perceived success in virtual teams and trust factors?

Research Hypotheses

This study hypothesizes that if trust is related to collaboration, then higher levels of trust will lead to a perception of enhanced collaboration in virtual teams. Similarly, if collaboration is related to trust, then higher levels of collaboration will generate a perception of greater trust in virtual teams. It is also hypothesized that if trust and collaboration are related to productivity, then higher levels of trust and collaboration will lead to a perception of enhanced productivity in virtual teams. Likewise, if trust and collaboration are related to success, then higher levels of trust and collaboration will lead to a perception of enhanced success in virtual teams. The following are the research study's null and alternative hypotheses:

Hypothesis HO1 (null): Trust in virtual teams is independent of collaboration factors.

Hypothesis HA1 (alternative): Trust in virtual teams is dependent on collaboration factors.

Hypothesis HO2 (null): Productivity in virtual teams is independent of collaboration factors.

Hypothesis HA2 (alternative): Productivity in virtual teams is dependent on collaboration factors.

Hypothesis HO3 (null): Productivity in virtual teams is independent of trust factors.

Hypothesis HA3 (alternative): Productivity in virtual teams is dependent on trust factors.

Hypothesis HO4 (null): Success in virtual teams is independent of collaboration factors.

Hypothesis HA4 (alternative): Success in virtual teams is dependent on collaboration factors.

Hypothesis HO5 (null): Success in virtual teams is independent of trust factors.

Hypothesis HA5 (alternative): Success in virtual teams is dependent on trust factors.

Significance of the Study

This research study can potentially provide new awareness, understanding, and knowledge associated with the factors of trust and collaboration in a virtual team context. Consequently, this fresh knowledge and understanding can be used to explain and predict the relationships among the variables of trust, collaboration in virtual teams enabling them to be perceived as more productive and successful. Additionally, the findings of this study can greatly assist business professionals and organizations achieve a perception of success, and productivity through the development of trust and collaboration in virtual teams. Organizations today must continually improve performance in order to compete productively in the world economy (Tansky & Cohen, 2001). This study's results can also contribute to improve virtual team relations. Moreover, there is a potential significance in what may be discovered in regards to trust and collaboration linked to virtual teams and a perception of productivity, success associated with their relationships.

Virtual teams will carry on being an integral part of successful business and as such, barriers associated with social processes, culture, trust, proximity and communication also continue to exist. Thus, knowing that these barriers can subsist, this research study may guide other people and organizations in understanding how others perceive virtual teams and the related constructs of trust and collaboration. Moreover, with the ongoing increase and need for virtual teams to conduct business, the more that is understood about virtual team relations, the better chances geographically dispersed

teams have in being perceived as successful (Castle, 2009). The new knowledge gained through this research can potentially help individuals, and businesses address the perceptions, issues, and risks associated with the factors of trust and collaboration in a virtual team context. Through sharing studies it can serve to provide the ability to create positive interpersonal relations between individuals on these teams, which in turn can be immensely valuable to business partners. In doing so, the understanding and knowledge gained from this study can ultimately lead to improved team dynamics and virtual team member relationships.

This correlational research study seeks to expand the existing theory of the relationship between trust and collaboration as they are related to the perceived success of virtual teams. The survey instrument used quantitative questions for gathering data for variable correlation and to bring out greater detail associated with the topics phenomena has many advantages in deriving rich data for analysis. Through an awareness and understanding of the determinants of trust and collaboration associated with virtual team relationships, it may, in turn, enable virtual team members and their leaders to better harness the benefits of these variables and the potential of critical relations-building variables. Additionally, the knowledge generated from this study might enable people and virtual teams to have the ability to cultivate trusting, collaborative relationships that reward or encourage positive interpersonal contact. Furthermore, this research can also help to unravel the intricacy of the complex interpersonal processes that are an integral and ongoing part of close relationships as well as their associated communication patterns.

Therefore, a heightened awareness and understanding of the factors of trust, and collaboration identified through this study may provide deeper meaning and it ultimately can add to the positive interpersonal relations between virtual team members from an assortment of different countries, backgrounds, cultures, and in a variety of business settings. Additionally, the research provides leaders and managers of organizations with knowledge that can enable them to create productive and successful virtual teams. It was important to the success of future virtual teams to determine and present the elements associated with trust, and collaboration and their perceived influence on virtual teams. This research provides the knowledge for individuals and the leaders of organizations so that they can establish virtual teams to be perceived as productive and successful.

In addition, it was also essential to identify the skills and competencies used to effectively build trust and collaboration in order to be able to unify people in virtual team relations. Also, the significance of this research study brings to light the various qualities of these variables that stimulate and reinforce relationships in virtual teams so that they may be widely shared and understood amongst leaders, managers, and virtual team members. This new data may also be beneficial to other researchers with curiosity in uncovering additional means of making virtual teams more successful and productive. Furthermore, this research offers the possibility for significant contributions to the already existing research and data on trust and collaboration in geographically dispersed virtual teams and these factors perceived impact on success and productivity.

Definition of Terms

The following section defines terms used throughout this dissertation. By understanding the ways these terms are used, the reader will gain a clearer understanding

of the research. To insure the value of a research study will not be destroyed by confusion about the meaning of constructs, Coopers and Schindler (2003) recommend using definitions to reduce such danger.

This study's findings suggest that virtual team relationship development requires trust, communication, collaboration, acceptance of diversity, and an assortment of critical factors in order to invite the positive interpersonal interaction between individuals on virtual teams. The primary operational terms used throughout this dissertation are presented as follows:

Definition of Terms

Virtuality. Virtuality means without a place as its home. Virtuality requires trust to make it work (Handy, 1995, p.44; Jarvenpaa et al., 1998). Additionally, the concept of virtual implies permeable boundaries and interface (Jarvenpaa & Leidner, 1999; Kristof et al., 1995; Mowshowiz, 1997). Lavin-Colky (2002) wrote that a virtual is a term employed to describe something that simulates reality. Also, something virtual can be just as effective, if not even more effective, than the real thing (Colky, Colky, & Young, 2002, p. 1).

Virtual Team. A virtual team is made up of individuals with differing competencies who are separated by space, time, and different cultures (Jarvenpaa & Leidner, 1999; Kristof et al., 1995; Mowshowiz, 1997). A virtual team's distinctive features are that they are comprised of mainly knowledge workers and professionals, they have a short life and a flexible composition, they are preponderant, and at times exclusive, their reliance on information and communication technologies rather than face-to-face contact, and their aptitude to cross traditional organizational time constraints

and boundaries. Therefore, virtual teams are groups of self-governing knowledge workers who share accountability for the completion of assignments, tasks, and projects, they are geographically dispersed, and interact exclusively through information and communication technologies (Piccoli, 2000).

Trust. Trust is demonstrated or confirmed if it increases a person's vulnerability to another individual or party, whose behavior is not under their control, in a situation in which the loss a person or party suffers if the other abuses that vulnerability is greater than one will receive if the other does not abuse that vulnerability (Deutsch, 1962). Trust is the acceptance of vulnerability to another's possible, but not ill will or lack of good will toward one (Baier, 1986). In addition, trust is also defined as the willingness of a party to be vulnerable to the actors of another party based on the expectation that the other party will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party (Mayer et al., 1995, p. 712). Others have defined trust as the psychological state comprising the intension to accept vulnerability based upon positive expectations of the intensions or behavior of another (Rousseau et al., 1998). According to Coleman (1998) trust may be considered a moral choice, and not directly observable. A four-part definition of trust is as follows: (1) placement of trust allows actions that otherwise are not possible; (2) if the person in whom trust is placed, the trustee, is trustworthy, then the trustor will be better off than if he had not trusted. Conversely, if the trustee is not trustworthy, then the trustor will be worse off than if he or she had not trusted; (3) trust is an action that involves the voluntary placement of resources (physical, financial, intellectual, or temporal) at the disposal of the trustee with

no real commitment from the trustee; (4) A time lag exists between the extension of trust and the result of the trusting behavior (Coleman, 1998).

Swift Trust. Swift trust is the willingness to rely upon team members to perform their formal and informal roles in a hastily formed temporary team (Zolin 2008). Swift trust is trust that is developed quickly even without direct and personal experience with another person (Meyerson et al., 1996).

Collaboration. Collaboration is described as behavior that attempts to completely satisfy the needs of parties that have dissimilar goals (Zolin, 2008; Mishra, 1996).

Collaboration involves both high cooperation, attempting to satisfy the other party's needs, and high assertiveness, attempting to satisfy one's own needs (Zolin, 2008).

Collaboration is working jointly or together with others. Also, it means to cooperate with others. It also means acting together to achieve a common goal.

Cooperation. Cooperation is the association of a number of individuals for mutual benefit. Also, it involves interaction that is beneficial to all those participating. It is the act of working together to meet universal objectives.

Demographics. Demographics are a selected population characteristic as used in research. Commonly-used demographics include age, race, gender, income, educational attainment, employment status, and location.

Operational Definitions

Arbnor and Bjerke (1997) wrote that an analytical approach formulates operational definitions of the concepts and of the specific phenomena that is to be discovered in objective reality. An operational definition includes: (1) a statement of which objects are to be observed; (2) A description of the situation in which the

observation is to take place; (3) A determination of the type of measuring scale to be applied to the data observes; and (4) the rules for how to handle the data obtained (p. 93-94).

Operational Definition of Virtual Teams

Virtual teams are comprised of individuals that interact using electronic communication and information technologies in geographically dispersed interpersonal settings, where the fulfillment of trust and collaboration is measured by their team member's ability to establish and enable relationships to develop and flourish through positive interaction.

Operational Definition of Trust

Trust is very complex and it has been identified as a multidimensional construct that influences relations in a multitude of interpersonal business settings, where fulfillment of expectations, the acceptance of risk and vulnerability is measured by the ability to establish and enable relationships to develop and flourish through positive interaction between individuals and parties.

Operational Definition of Collaboration

Collaboration involves decision-making, team member support, and a need or desire to create, make discoveries, or solve problems utilizing positive team and business processes in order to generate productivity and successful outcomes.

Assumptions and Limitations

The assumptions and limitations of this research study are key to the successful interpretation and presentation of research regarding trust and collaboration in virtual teams. All research studies have their own limitations, and they can be an aid in

supporting the study's validity (Cooper & Schindler, 2003). Creswell (2003) advises that the provision and description of limitations will aid in identifying the potential weaknesses of the research study (p. 148). Plus, limitations are also useful for placing boundaries on the scope and the implementation of the research.

Underlying Assumptions of the Study

The methodological, contextual, and analytical assumptions that influence the interpretation of findings of this study are described below. It was assumed that this researcher's own experiences were useful in understanding and interpreting the literature on trust and the experiences of the study's participants. In addition, it was assumed that the contextual assumptions of this study would become a reality in the embedded environment and context, and they would have implications for practical use in developing relations. The following assumptions relate to data on trust and collaboration and their influence on relationship development:

Methodological and Contextual Assumptions

- (a) Data collection agencies collect and disseminate trust, communication, collaboration, and demographic statistics.
- (b) Data dissemination was timely and symmetrical.
- (c) Data was complete, comprehensive, consistent, and comparable.
- (d) Data was reliable, available, and accessible.

Analytical Assumptions

- (a) Trust and collaboration was assumed to be integral to interaction between people, and without this assumption individuals and parties would develop relations despite the potential risk and vulnerability to and/or from others.

- (b) Although, trust and collaboration are widely valued for its importance to relationships, it was not very well understood due to the complexity and abstract nature of the concepts.
- (c) Trust and collaboration were assumed to be multidimensional concepts or constructs.
- (d) Because of the gap in knowledge associated with trust and collaboration in virtual teams, deeper insight and a broader understanding needed to be established as a basis for scientific development.
- (e) Participants would respond openly and honestly to the study's survey instrument.
- (f) Participant's responses and experience was representative of virtual professionals with significant experience with geographically dispersed virtual teams.

Limitations

This study of trust and collaboration and their influence on virtual team relationships were limited by methodology and data availability. A survey methodology can introduce distortions affecting generalization, as well as validity and the reliability of the research. The researcher, as one of the instruments of data collection, also introduces biases. Also, the general limitations that restrain generalization also threaten validity and to a lesser extent reliability. Some of the methodological limitations of this study were:

- (a) Due to data being collected in a controlled environment a degree of artificiality was introduced into the situation. This artificiality might have caused the various

- participants to act differently than they might act in a real-life situation and, therefore, obscure the results.
- (b) The use of quantitative methodology introduces some degree of limitation and artificiality to the study's outcome.
 - (c) Single method data gathering was also a limitation, because by using only one method subjects can relate the results generated to a common method variance in which the relationship among variables measured might be influenced by their common association with the survey methodology and not be related to the underlying constructs being measured in the research (Podsakoff & Organ, 1986).
 - (d) This study's methodology was not able to examine trust and collaboration over time because of both time and monetary constraints. Also, the participant's responses and data collected from the different participants were limited to the survey's time frame.
 - (e) Another limitation could result from participants being able to understand the various questions in the study's questionnaire process.

Nature of Study

In order to adequately investigate the affect of trust and collaboration on virtual team relations from a virtual team member's perspective, this study utilized a descriptive corrolational design, a systems approach, and a quantitative survey instrument for gathering and analyzing data. Participants in the study were selected from a pool of business professionals listed in public directories and residing in the United States of America. This population was selected in order to investigate their perceptions associated with the factors of trust and collaboration and their perceived impact on productivity and

success in virtual teams. In turn, this potential new knowledge may generate practical understanding and wisdom about fostering increased trust and collaboration and influencing a greater perception of productivity and more success in geographically dispersed virtual teams.

Research Study Summary

The first chapter of this research study was comprised of an introduction to the problem, the background of the study, and a statement of the problem. It also includes the study's research questions, hypotheses, and the purpose of the study, the study's rationale, and the significance of the study, a definition of terms, and the assumptions and limitations of the research.

Organization of Remaining Chapters

Chapter 2 contains a review of the literature relevant to investigating the variables of trust and collaboration and their impact on virtual team productivity, success, and relationship development. The topics covered include literature associated with trust and collaboration as well as literature on virtual teams is presented historically in chronological order. Chapter 3 contains an organized and detailed description of the research study's methodology. Chapter 4 tests the research hypotheses and provides analysis of the research findings. In Chapter 5 the study's conclusions are presented, as well as, recommendations for future research.

CHAPTER 2. LITERATURE REVIEW

Introduction

Trust is at the heart of establishing and developing collaborative relations with others (Kouzes & Posner, 1999). This dissertation was focused on studying trust and collaboration in virtual team relationships. An extensive search and review of literature involving virtual teams revealed that many different authors have addressed virtual teams and the influence of key factors on it. There is, however, a gap in the literature in terms of what has been said about how trust and collaboration affect relations, and the perception of productivity, and success in virtual team communities. This study investigated the various phenomenon linked to trust and collaboration related to virtual team interaction.

The sources of data used within this literature review came from publications that were from the areas of business administration, management, psychology, and sociology. An examination and analysis of the sources used for the study shows that many of them deal with the topic of geographical dispersed virtual teams, yet there is little discussion associated with trust and collaboration on these teams. Since there is a small amount research available on this topic, this literature presents the current input on trust and collaboration in virtual teams.

Rational of Review

The intent of this study was to determine if there is a relationship between trust and collaboration and productivity and success in virtual teams. Based upon this analysis,

the critical virtual team factors influencing the impact, productivity, and success of organizations were identified and presented in the review. Therefore, the following areas of literature and research were selected as being relevant and related: (1) virtual team trust, (2) swift trust in virtual teams, (3) virtual team collaboration and cooperative behavior, and (4) trust enhanced collaboration and co-operative behaviors.

The body of knowledge related to trust and collaboration in virtual teams is starting to grow. Therefore, a general understanding of critical success factors is important for leaders and managers in order to create and establish productive and successful virtual teams. Consequently, a review of related literature is presented to help identify these critical success factors and the importance of the increase of quantitative research in this area of emphasis. Quantitative research into the virtual team success factors can add to their importance for the organizations. The findings of the present literature review assist this study in providing a framework for knowledge and understanding of virtual team dynamics to be built upon.

Theoretical Framework

Virtual team theories have been researched for a short time, and there needed to be a complete understanding of the effects that trust and collaboration have on productivity and success of virtual teams. This study looks at the relationships between trust and collaboration and explores how they impact productivity and success in virtual teams. In doing so, it may help bridge the gaps or resolve the controversies and lead to greater understanding of the problem associated with developing virtual teams to be productive and successful.

Review of Virtual Team Literature

This review includes literature used in the study regarding the elements of trust and collaboration as they relate to virtual team relationships. The literature review sources used in this study are those that provide understanding, insight, and knowledge associated with investigating the theories, perceptions, and phenomena associated with these variables and the development of relationships in virtual teams with their members in different locations. These articles and pertinent information provide a grounded basis for this research study.

Arbnor and Bjerke (1997) advocated that research aspires to be objective and does so by bringing values into the open, making them conscious, specific, and explicit, and openly clarifies how theoretical constructions were determined (p. 247). Objective literature can be very effective in removing and/or eliminating bias in the approach to, and the interpretation of, the data. The aim of this literature review is to provide valuable data in the study of the trust and collaboration and their impact in establishing and managing productive and successful relationships in virtual teams. The five main topics that will be discussed throughout the literature portion of this study are as follows: (1) the evolution of virtual teams, (2) virtual team trust, (3) swift trust in virtual teams, (4) virtual team collaboration and cooperative behavior, and (5) trust enhanced collaboration and cooperative behaviors.

The Evolution of Virtual Teams

The utilization of virtual teams can have substantial benefits and also offer many advantages. For example, these potential advantages include the ability to hire people with the best skills, competencies and talent regardless of location, lengthen business

hours by expanding across time and space, increase productivity by reducing distractions and commute times, and maintaining a competitive advantage in the global marketplace. By viewing these benefits and advantages collaboratively, these incentives are motivating an increasing number of individuals and organizations to use global virtual teams for their business operations (Albertson, 2009; Peterson & Stohr, 1999). Virtual team collaborations are becoming more common, as businesses are increasingly accomplishing their goals and tasks through the use of computer-mediated teams. In doing so, the lack of visual interaction and the distance between the team members can affect their performance and development (Bennett, 2009).

Despite the myriad of apparent benefits of collaborative virtual teams, it is difficult for their team members to achieve consensus and to share their opinions and beliefs (Tseng, 2008). The collective effect of the cultural, physical, psychological, and social environments creates a perceived remoteness between the members of virtual teams. This virtual separation is the barrier that must be overcome to ensure virtual team success. Although the virtual team's objectives and tasks may call for interdependent actions, trust and commitment must be developed in order to transcend the obstacles inherent to virtual teams (Ryan, 2008).

Being virtual is in the majority of situations is not a strategy; instead it is an operational reality. Hence, the decision to use a virtual team is frequently not a choice, but a necessity (Clayden, 2007; Gassman & Zedtwitz, 2003). Virtual communities involve several free will agents that rely on informal communication and interact with one another electronically (Ngo-Mai and Raybaut, 2007). Current research has indicated that virtual teams today are as effective as face-to-face teams. Geographically dispersed

virtual teams are becoming more common worldwide (Karpiscak, 2007). Globalization, technology, and the requirement to transfer information at the speed of light according to Lucas (2007), have necessitated the creation of a new organizational paradigm called virtual teams (Solomon, 2001).

Workers interacting in a virtual environment, says Howard (2004), are the result of the increasing numbers of workers that are no longer co-located with their team members. These team members are capitalizing on technology to communicate, provide advantages to projects, and to meet both team and organizational objectives. Team members can be, and often are, located in multiple geographic regions because ubiquitous nature of technology (Howard, 2004).

By being not co-located, a virtual team can have representation from multiple organizations or from a single company, and they can be formed for work on a single project or brought together for a longer period of time. Once formed, a virtual team can generate many advantages to a company, its employees, and to its customers (Howard, 2004). Due to the new pressures facing firm's worldwide; it has led many organizations to incorporate the use of virtual teams. This is because technology allows new ways of processing, structuring, and distributing communication, and work activities in order to overcome the boundaries of space and time. Enabled by progressive communication and information technologies, virtual teams are an evolutionary form of face-to-face teams (Davidow & Malone, 1992; Jarvenpaa & Ives, 1994; Tocci, 2003).

Lavin-Colky (2002) wrote that a virtual is a term employed to describe something that simulates reality. Something virtual can be just as effective, if not even more effective, than the real thing (Colky, Colky, & Young, 2002, p. 1). The movement toward

virtual teams is on the increase (Zolin & Hinds, 2002; Armstrong & Cole, 2002). Highly dispersed structures in teams and with functions and individuals that are not in the same place and at the same time, characterize virtual teams (Solomon, 2001). Business environments according to McFadzean (2001) are being transformed by the application of the virtual settings and the employment of virtual teaming. These platforms for interaction enable people to participate and collaborate from all corners of the globe at any time of the day or night. Business organizations are using virtual environments, networked via the Internet, to deliver their correspondences amongst one another. Consequently, this type of virtual interpersonal interaction can be undertaken any place or any time (Hislop, 1997; McFadzean, 2001). Some teams are comprised of members who are dispersed geographically, yet are culturally and organizationally homogeneous. While other teams may include members who go beyond cultural and organizational boundaries, however they are physically co-located. Therefore, very few pure virtual teams exist (Wong & Burton, 2000, p. 341).

New territory for working collectively apart has been created by distance spanning communication technologies. As a result, international teamwork has become an everyday reality. Although information and communication technologies create business opportunities and enable people to communicate with their partners in faraway places, people cannot rely on technology alone to create a sense of teamwork or commitment (Kezsbom, 2000).

Virtual Team Trust

The sharing of concerns and ideas, achieving project goals, and working effectively as a team can be accomplished much more freely when virtual team members

trust one another. Organizations with high levels of trust are considerably more productive, creative, and profitable than firms that experience low levels of trust (Hart, 2009). Businesses and organizations that pool knowledge workers quickly together from different skills, talents, competencies, functions, organizations, and locations without geographical restrictions can leverage their virtual teams as a factor of competitive advantage. Approach, methodology, and tools that are used amongst the team determine the success of these teams (Serrat, 2009).

Trust in virtual teams is empowering, enormously powerful, and it can yield profound results. People, who trust the individuals they work with are honest, inclined to act trustworthy, less resistant to change, open, self-assured, and a willingness to take risks. Additionally, because trust is a very valuable asset, it is considered to be part of a team's social capital. Virtual team trust is a very valuable asset, because it generates commitment, continuous improvement, cooperation, extra effort, and sharing of information and knowledge that can all propel a team to survive and achieve a competitive advantage. Thus, the effort to build a culture of trust is more than justified (Williams, 2008). Trust provides a sound foundation of teamwork and collaboration. Additionally, trust is associated with vulnerability, expectations, and risk. Trust creates a condition in which teammates find comfort in being open in regards to their attributes, weaknesses, and fears. However, the task of building trust takes time and commitment. Furthermore, trust on a team is never complete; it must be continually cultivated, nurtured, and maintained (Haller, 2008).

Trust takes time to build says, Pratt (2008) because it can only be earned. Trust is easier to foster and maintain in smaller teams, therefore it is suggested that a team consist

of less than 10 members. A requirement for trust is good communication, honesty, integrity, vulnerability, and behavior that make obvious that the team goals are more important than individual goals. Without trust, people do not fully participate, issue political or guarded comments, they might avoid commitment, fail to buy in, and steer clear of accountability. Although it may be uncomfortable for team members, trust makes it possible to push people respectfully, thus making real change more likely (Pratt, 2008).

A foundation of collaboration is trust is built on promises. Trust can take months in context of a virtual team to completely develop. If the team is spread across a very wide area, there will be less daily clues to help to build trust therefore at times it can take even longer. Instead of being developed from perceptions of personal manners or mannerisms, virtual teams working across distances create a situation in which trust is based on the work delivered. Moreover, good teamwork is constructed on the ways that people earn trust from others. Trust is created through being trustworthy and the communication of what others must do to earn it. A mutually trusting team will greatly outperform a group that is constantly trying to cover up for their lack mutual trust. Hence, it is smart and progressive to concentrate on trust development as an integrated part of a virtual team's management (Promises: Roots of business, promises yield trust; trust yields results, 2008).

One of the most significant issues confronting virtual work groups is trust. The necessity to work with others through a text-based online environment can make trust issues all the more salient. In these virtual settings, the diminishment of physical cues serves to only provide limited information for team members to utilize in order to assess trust. Moreover, the need to understand trust issues becomes fundamental as the use of

online collaborative teams increases. Although trust is essential for virtual team success, the research yields contradictory results leaving researchers and practitioners with several unanswered questions associated with trust issues in virtual groups (Smith, 2008).

Associated with the degree of reliance people have on the remotely located members of their virtual team taken collectively is trust (Karpiscak, 2007; Sarker et al., 2003, p. 37). There is a definite link between trust and effectiveness and efficiency of a virtual team (Karpiscak, 2007; Snow, Snell, & Davison, 1996). Additionally, by establishing, improving, and maintaining trust virtual teams is critical in order for them to function dynamically. Therefore, improved trust generates better virtual team performance (Karpiscak, 2007). In addition, virtual teams with higher levels of trust can outperform teams with lower levels of trust (Karpiscak, 2007; Lawley, 2006, p.14). Also, trust has the ability to reduce costs as a result of collaboration either through enhanced creativity or the requirement for a reduction control impacting productivity (Karpiscak, 2007; Lawley, 2006; Zucker, Darby, Brewer, & Peng, 1995). Additionally, virtual teams are created to generate knowledge, thus the team members need to be able to trust one another if they are going to carry out their objectives and goals (Karpiscak, 2007; Solomon, 2001, p. 63).

Virtual team members advocated Clayden (2007) must develop trust in one another to realize their potential and ultimately be successful (Andres, 2002; Bell & Kozlowski; Holton, 2001). Trust is a major factor in the success of virtual teams because it is derived from team members communicating, completing tasks and assignments, participating, and being enthusiastically on board with objectives and projects (Clayden, 2007). The determinants for the success and effectiveness of virtual teams is their

willingness and ability and to work out cultural differences, their capability to acknowledge differences in skills, competencies, and interests, and the team's proficiency in incorporating technologies that efficiently span space and time (Croasdell et al., 2003). During a virtual team project, trust is established and developed based on a foundation of individual and team performance. Additionally, actions such as the timely delivery of assignments, ability to carry out assigned tasks, presentation of completed tasks or assignments, by being proactive, and through participating in team processes and functions (Clayden, 2007).

Altschuller (2007) said that trust is one of the primary socio-emotional issues linked to virtual team interaction. Trust is glue that provides a cohesive bond amongst virtual team members. Trust invites participation which in turn propels a team toward the successful accomplishment of objectives and goals (McAllister, 1995; Paul & McDaniel, 2004; Sarker et al., 2001). Virtual team member trust enables teammates to easily accept each other's assertions, experiences, and thoughts as input that is valid the team's final decision. In addition, electronic communication media has a key role in the overall effect that trust has team member's output in regards to the way that it can convey teammate's assertions, personal experiences, and thoughts (Altschuller, 2007).

An empowering, salient, and fundamental variable in the effectiveness of collaborative relationships is trust (Gefen, 2002; Gray, 2007; Kirkman, Rosen, Gibson, Tesluk, & McPherson, 2002; Koeszegi, 2004). Also, identified as the most important ingredient in virtual relations, trust enables successful interaction and the promotion of teamwork (Gray, 2007; Hacker, 2005; Lencione, 2002; Lu et al., 2006; Walther & Bunz, 2005). Virtual team members need to depend on one another in order to be able to

achieve the strategic goals of their team. These teams are challenged to collaborate cohesively and to overcome obstacle, in order to do so, they will need to build and develop trust. Virtual team members have very few indicators available, such as subtle verbal and nonverbal cues. Because of this dilemma, team members typically have fewer cues and bits of information to process from which trusting impressions are formed (King, 2007).

An open mind and a willingness to listen stated, Peters & Manz (2007) enables virtual team members to trust in their teammates. Individuals on these teams must also have the ability to be supportive, handle conflict productively (Peters & Manz, 2007). The introduction of collaborative work in virtual teams has created a shift in which direct control is no longer possible. Trust in the place of control serves as a key aligning mechanism for individuals that are geographically separated and that expend much of their time working in locations on their own distant from their teammates and leaders (Knight et al., 2001). Virtual teams without trust individuals and their teams could not be effective, because trust enables people to be willing to take the risk that another team member would not act or behave in their own self-interest, rather than the interest of the team (Zand, 1972). Conditions of complexity and uncertainty exist in virtual teams; therefore if trust and if mutual confidence is present, coordinated action is optimized (Peters & Manz, 2007).

Trust develops through meaningful and frequent interaction in a virtual team according to Peters & Manz (2007), results in making teammates feel relatively secure in sharing concerns, insights, and conflicting opinions without the fear of repercussion (Holton, 2001). Therefore, team member's familiarity with one another prior to working

on a virtual team may have a noteworthy effect on their level of collaboration by directly influencing the team's ability to trust each other (Peters & Manz, 2007).

The various aspects of trust states, Ngo-Mai & Raybaut (2007) play an important function in the durability and emergence of bilateral virtual team interaction (Handy, 1995; Hung et al., 2004; Reagle, 2005).

The continual exchange of an array benefits between team members, states Werko (2006) generates trust (Blau, 1964). Communication, goal setting, leadership, technology, and trust are all vital in the construction of a flourishing virtual team (Bergiel, Bergiel, & Balsmeier, 2006; Lsfahani, 2002). Trust is the basis of all successful relations. In order to be successful, virtual teams need to build their relationship intentionally and with care (Bergiel et al., 2006; Corpola, Hiltz & Rotter, 2004). Trust is frequently the result of virtual team member's acknowledgement that each individual on the team can be counted on to accomplish his or her portion of tasks or assignments. Therefore, in personal and team relations, trust must exist because it is an important element that enables interaction and collaboration between parties (Bergiel et al., 2006). When there is respect, equitable tension, and trust among team members, productivity and reactivity are optimized. Trust is a key antecedent to effective collective creativity (Ind & Watt, 2006). Virtual distance has been significantly and negatively related to trust, and through mediating these variables it can influence project success (Sobel-Lojeski, 2006).

The influence of trust on virtual team performance as pointed out by Hardin (2005) represents a natural extension of the trust's influence various forms of organizational performance (Mayer et al., 1995). According to the time integration and performance theory (TIP), virtual teams progress through four modes in order to be

successful: (1) inception and acceptance; (2) problem solving; (3) conflict resolution; and (4) execution. However, in virtual teams the use of communication and information technologies may impede the modes and a function of virtual team's, inhibiting the building of trust (Hardin, 2005; McGrath, 1991).

Relationship building, cohesion, and trust according to Powell, et al., (2004) are fundamental processes that foster team effectiveness, however virtual teams face tremendous difficulty in achieving them (Alexander, 2000; Kezsbom, 2000; Lipnack & Stamps, 2000; Solomon, 2001). As a result of the difficulty involved in accessing virtual teammate's trustworthiness without ever meeting them, trust development in virtual teams presents significant challenges (McDonough et al., 2001). Also, for the successful completion of virtual team projects, Trust development and maintenance is deemed crucial (Sarker et al., 2001).

Serva and Fuller (2004) wrote that trust creates an assortment of benefits in virtual team-based, academic environments (Huff et al., 2002) Trust enables students to concentrate on problems, this is because teams share trust require very little additional monitoring by their members. Collaboration is enhanced, since team members that trust one another are more likely to forgo personal objectives for the collective good of the virtual team. The overall potential benefits derived from the use of teams depend upon trust and cooperative activities that smooth the progress of successful teamwork (Larson & LaFasto, 1989; Serva & Fuller, 2004).

Trust in virtual teams is conceptualized as a multi-dimensional construct that as an emergent state that has affective and cognitive and dimensions, and a personality composition factor. Trust indirectly influences a team's performance through its effect on

team processes, such as communication, decision-making, and problem solving (Boss, 1978; Kiffin-Peterson, 2004; Klimoski & Karol, 1976; Larson & LaFasto, 1989; Zand, 1972). When virtual team members trust one another they can: (1) exchange relevant ideas and feelings openly; (2) define their goals and problems clearly and realistically; (3) searched for alternatives more extensively; (4) have greater authority on solutions; (5) be more proficient and satisfied with their problem solving efforts; and (6) have motivation to put into practice solutions (Kiffin-Peterson, 2004; Zand, 1981).

Trust is more difficult to build amongst people who rarely, if ever, see one another (Maitland, 2004). Trust is a confident and positive expectation of the behavior of another individual or group that allows cooperation to take place. Trust also aids in complexity reduction even in cases in which there is incomplete and ambiguous information and where people must act although there is uncertainty (Cook & Wall, 1980; Currall & Judge, 1995; Kramer & Tyler, 1996; Luthans, 1992; Mayer et al., 1995; Pantelli & Duncan, 2004). Within information age virtual teams, trust is a need to have quality in order to stimulate productive relationships (Lipnack & Stamps, 1997, p. 225; Pantelli & Duncan, 2004). Trust is great for enhancing communication and improving the overall performance of individuals and teams (Jarvenpaa & Leidner, 1999; Pantelli & Duncan, 2004; Sarker et al., 2001).

Given the obstacles that may hamper the establishment development and maintenance of trust in virtual teams is the most important variables leading to virtual team success, (DeRosa et al., 2004; Zaccaro & Bader, 2003). An essential element influencing a team's positive interaction is the degree of trust shared amongst members of a virtual team (Furumo, 2005; Jarvenpaa et al., 1998; Jarvenpaa & Leidner, 1999).

Trust is reflected by belief in individuals, a team, or an organization's fairness, integrity, and reliability. Virtual teams that achieve higher levels of trust join together easily and manage themselves much better (Furumo, 2005; Lipnack & Stamps, 1997). It is possible for trust to exist in teams that only use electronic communication between their members. A form of swift trust is experienced in virtual teams; however it is fragile and can be short lived (Furumo, 2005; Jarvenpaa & Leidner, 1999).

High trust according to Jarvenpaa, Shaw, and Staples (2004) has been observed in virtual team relations. Trust is also present even in the initial phases before members of virtual teams have had a chance to interact (Iacono & Weisband, 1997; Jarvenpaa, et al., 1998; Jarvenpaa & Leidner, 1999; Kramer, 1994; Meyerson, et al., 1996).

Hence, virtual team members need trust in order to perform well and given proper amount of time they will bond, develop trust, and ultimately improve their performance. Additionally, since organizational elements are socially developed through team member's interaction, the individuals on the team will develop perceptions of their social interaction and task characteristics differently over the course of time. In doing so, it will work to vary group processes and their outcomes. Therefore, as a result, building trust and the accomplishment of team outcomes will vary according to the perceptions of the team members over time (Araujo, 2004). In a virtual context, the team members not only bring their existing perceptions and motivations of the global workplace expressed in terms of disposition to trust, but also change and develop their prior perceptions based on cases that are embedded by the interaction of patterns (Araujo, 2004).

In a virtual setting, states Araujo (2004), a person's faith in humanity helps to predict a team member's tendency to believe in other group members based upon his or

her own personal characteristics in spite of whether the trustee is reliable or not. Also, a person's trusting instance aids in predicting that an individual will intend to trust others from a calculative outcomes foundation rather than from perceived characteristics of the individuals on the team. Therefore, in new relations, in which people have not had much time to interact with one another, these effects will most likely to be the strongest. Over time, as the team members interact, their behavioral patterns and attitudes unfold providing the clarity that enables the virtual members to develop perceptions of others contributions and their work. In doing so, this action offers additional factors to support trustor actions (Araujo, 2004).

Araujo (2004) said that typically virtual teams initiate their interpersonal interaction with no previous knowledge of their partners. Thus, at the very beginning stages of virtual team interaction, people on the team will only of had limited opportunities to observe others member's interactions. Hence, their perceptions of other's characteristics will be inadequate. Such limitations of one's capability of developing perceptions of the people and the process will likely guide them towards relying on public knowledge of others and their own personal beliefs. A disposition to trust others can provide relevant information on how virtual team members trust each other at the earliest stages of team interaction (Araujo, 2004).

Araujo (2004) stated that in a virtual environment where team members are geographically separated from one another and interact only through communication technologies, team interaction and results might suffer due to communication constraints and distance between parties. Outcomes of these inherent constraints are: (1) difficulty in team members collaborating, (2) social presence of low levels, (3) lack of instant

feedback, (4) social loafing, and (5) communication being set within contextual parameters and constraints (Daft & Lengel, 1984; Lewicki & Bunker, 1995, p. 133; Lipnack & Stamps, 2000; O'Hara-Devereaux et al., 1994). Over time, individuals on these teams will share relational information and thus improve their capability to evaluate other virtual team members and develop improved perceptions of social interaction (Araujo, 2004). In a virtual setting, Araujo (2004) points out, very few clues exist about other people's abilities, work patterns, or motivations, because virtual team members rarely see one another, they do not share the same physical location, and interact with individuals with whom they have never worked or met before (Walther, 1992). Developing a sense of community amongst the team members says Howard (2004) trust is established and built in a virtual team (Handy, 1995). Trusting work relationships according to Gehrke-Walters (2004), influence increased organizational commitment, a reduction in conflicts, and team cooperation (Morgan & Hunt, 1994). High trusting teams are more innovative, open to discussion, proficient at problem solving, and display greater self-control (Zand, 1972). Charm and charisma are like a glider, says Conn (2004) they fly, but not indefinitely, and they don't do so well in turbulent times. Thus, a person on virtual teams learns the hard way that promising strategies and good ideas are usually not enough. They often discover they cannot make it without trust (MacDonald, 2003, p. 55).

Notions of trust, cohesiveness, and cooperation among team members striving for the achievement of shared objectives and goals is linked to the concept of teams. Virtual team effectiveness and dynamics depend upon the development and the maintenance of

trust amongst its members and between the team and their leader (Jarvenpaa et al., 1998; Kezsom, 2000; Tocci, 2003; Townsend et al., 1998).

Cohesion is a critical factor influencing the effectiveness of groups and teams stated Sarker, Valacich, and Sarker, (2003) and the degree of trust in those relations is a chief factor leading to a team's cohesiveness (Cohen & Bailey, 1997). A central challenge for virtual teams is the development and maintenance of trust. This is because the nature of computer-mediated commerce principally used by virtual teams inherently increases perceived risk and slows down progression. In virtual teams, the lack of synergy and physical interpersonal interaction and that frequently accompanies face-to-face communication may inhibit the traditional methods of building trust (Cascio, 2000; Hung, et al., 2003). In a virtual environment in which traditional social control authority gives away to self-control and to self-direction, trust is even more significant (Handy, 1995; Hung, et al., 2003).

Costa (2003) discussed trust in work teams, saying that trust is a multi-component variable with distinctive yet related dimensions. These include co-operative behaviors lack of control and ability to monitor, the propensity to trust, and perceived trustworthiness. The various collaborative approaches to effective work teams highlight sharing of responsibilities, co-ordination, and the participation of team members in the decision process (Keen, 1990). Also, the transferability of trust is affected by contextual and relational conditions (Stewart, 2003). Trust is a key factor that underpins effective co-operative behaviors, stated Erdem, Ozen, and Atsan (2003) and therefore has a noteworthy effect on associated risks and change processes (Shockley-Zalaback, Ellis, &

Winograd, 2000). The reliance individuals have on their distantly located collective of team members creates virtual team trust (Sarker et al., 2003, p.37).

The members of distributed teams are less likely to develop trust and rapport, as pointed out by Zolin and Hinds (2002) because they commonly spend less time in the presence of each other. Due to distance separating virtual team members, spontaneous interaction is much more difficult thus reducing interpersonal attraction and information sharing between their members (Kiesler & Cummings, 2002). However, the interaction between team members tends to boost feelings of familiarity by being associated with others, which serves to promote the development of trust in work teams (Zajonc, 1968; Zolin & Hinds, 2002). One of the primary factors in determining the success or failure of virtual teams is trust. The combination of open communication, cooperation, risk-taking, and higher quality and satisfaction in the decision-making process leads to generating trust in virtual teams (Driscoll, 1978; Holden, 1990; Kanawattanachai & Yoo, 2002; McKnight & Chervany, 2000; Parks, Henager, & Scamahorn, 1996; Schlenker, Helm, & Tedeschi, 1973; Smith & Barclay, 1997; Zand, 1972). Also, the success and effectiveness of virtual teams begins with trust, because it functions like glue that holds and bonds virtual teams together (Kanawattanachai & Yoo, 2002; Lipnack & Stamps, 2000). Trust in fellow co-workers or an organization is considered to be an important component in the success and relations of virtual teams (Kanawattanachai & Yoo, 2002; Kristof et al., 1995).

By doing real work together, it is one of the best ways for virtual team members to develop trust in one another. People have greater trust in other people who act and behave with integrity. Encouragement of the team to earn the trust of others, and then

translate that gained trust into greater creativity, commitment, team performance, and satisfaction is an essential job of virtual team leaders and their members (McKenna & Maister, 2002).

Trust according to Herzog (2001), is a success factor in successful team collaboration. Also, a high level of trust creates and sustains collaborative teams that are much better positioned to take action to place them successfully and strategically in position to adapt to changes in technologies and economics. In today's ever-changing business world it is necessary to constantly update one's appreciation of trust and reinvest in the building and development of team trust. Furthermore, trust is the basis upon which virtual team members are able to construct profitable and successful collaborations. It is essential for teams and the individuals in them to foster and nurture trust in their relations with one another in order to be as effective as possible (Herzog, 2001; Marks & Mirvis, 1998). When people trust their team, their colleagues will develop a high propensity to trust others. The individuals will also have a strong propensity to perceive others on the team as being trustworthy, frequently take part in co-operative behaviors, and not spend their time monitoring their colleagues (Costa et al., 2001).

Even in the best of times and conditions, states Kezsbom (2000), that effective teamwork and cooperation is difficult. Virtual team member's ability to trust one another promotes team spirit and enhances a team's performance. Additionally, for the relationships that foster trust, technology is not a substitute. In order to be successful teams, it is imperative to pay a particular attention to building a strong foundation of teamwork. When virtual teams work together, yet are apart, they must work even harder to compensate for the elements that are inevitably lost in their interaction. Therefore, trust

is a very important element for effective interaction leading to the success of virtual team enterprises (Jarvenpaa et al., 1998; Lipnack & Stamps, 2000). Virtual team environments provide clear links between team processes and their outcomes (Potter & Balthazard, 2000; Ryssen & Godar, 2000). Because virtual teams are self-controlling and self-directional, trust is critical for a virtual team (Cascio, 2000). In addition, the greatest challenge in creating virtual teams that are successful is developing and maintaining trust. Trust often requires as much face-to-face interaction as is practical on a virtual team. However, because face-to-face time is difficult on a virtual team, other actions are needed to stimulate trust. These trust stimulation activities include establishing norms around virtual team communication patterns, rapidly responding to virtual teammates, reinforcing consistency of interaction and timelines, and achieving performance objectives (Gibson et al., 2002).

Swift Trust in Virtual Teams

Swift trust according to Zolin (2008) is the willingness to be reliant upon team members in order to perform their informal and formal roles within a hastily created temporary team. When there are demands due to importance of task or time commitments associated with completing assignments and project goals, swift trust is proposed to operate particularly in temporary teams. Swift trust can be developed in virtual teams through good communication and establishment of roles that provide clarity within teams (Mishra, 1996). Altschuller (2007) said that in order to achieve the full responsiveness and the flexibility of benefits derived from their work style, virtual teams depend on the aptitude to form trusting relations among their members quickly (Dani, et al., 2006; Jarvenpaa & Leidner, 1999). Impacting a virtual team's overall long-term efficiency and

cohesiveness is a fragile and temporal form of swift trust (Gray, 2007; Corpola et al., 2004; Jarvenpaa et al., 1998, p. 2). The behavior in temporary teams formed to accomplish a common task or assignment with a limited life span is explained by swift trust. Virtual team members are most likely to import trust expectations based upon familiar situations when time pressures and stringent deadlines offer very little opportunity for a team's individual members to build trust through relationship building and firsthand interaction (Gray, 2007; Meyerson et al., 1996).

Swift trust, says Ngo-Mai & Raybaut (2007), substitutes action and broad categorical social structure for interpersonal relations dimensions. This acknowledges that virtual communities are integrated with team members with cultural, geographical, and skill differences, and without a common past or future, therefore it stands to reason that these teams cannot rely on traditional trust building. Instead virtual teams are reliant on a particular form of trust that is strongly built on current action of the virtual team along with pre-existing stereotypes. Hence, swift trust in virtual environments is viewed as very fragile and temporal (Galvin, McKinney, & Chudoba, 2005; Hung et al., 2003; Meyerson et al., 1996; Ngo-Mai & Raybaut, 2007).

Furumo (2005) also stated that virtual teams could experience a form of swift trust that is fragile and can have a finite lifecycle (Jarvenpaa & Leidner, 1999). Specific communication patterns according to Hardin (2005) aid in the facilitation of a fragile form of swift trust among virtual teams and their members (Meyerson et al., 1996). Swift trust in temporary work groups is strengthened by team member's reputation, as promulgated by formal qualifications or counsel of respected intermediaries or from

within relevant social networks, or from externally derived evidence of trust (Dietz & Hartog, 2006; Meyerson et al., 1996).

Traditional trust development processes utilized in online and temporary group's states, Sobrofski (2004) are not practical for virtual team trust building. This is because the participants on virtual teams insufficient time to cultivate trust in a traditional way. Swift trust is required to be created when groups must move very quickly and will most likely never work with one another again. Virtual team members frequently proceed as though trust development process had already taken place and are apt to trust other teammates until someone breaks that trust (Meyerson et al., 1996).

Swift trust for temporary teams says, Feng, Lazar, and Preece (2004) is created around a clearly defined purpose and common assignments and tasks with a limited life span. Swift trust factors include a willingness to postpone doubt in regards to whether others, that are strangers, can be relied on in order for team collaboration to take place so that tasks and projects can be completed. Swift trust is also supported by positive expectations that the virtual team's activity and direction undertaken will be beneficial (Meyerson et al., 1996). Swift or initial trust according to Serva and Fuller (2004) refers to trust in an unknown or unfamiliar trustee, a relationship in which individuals have yet to gain credibility, associated meaningful information, or affective bonds with one another (McKnight et al., 2002). Individuals working in a virtual team frequently assume that trust will be established and developed automatically. However, the virtual teams that are the most successful make a significant effort towards trust development (Maitland, 2004).

Trust can be created in a successful virtual community, however with unique communication and collaborative behavior. Once established, early trust formation can be reinforced and enhanced by leaders and instructors by involving their team members in meaningful tasks, and utilizing strategies that motivate, encourage, and stimulate participation (Corpola, 2004). The communication behaviors conveying enthusiasm facilitate early trust and also correlate with the virtual team's positive expectations amongst their members (Corpola, 2004; Jarvenpaa & Leidner, 1998). Once established, swift trust can shift to other trust forms and last into the remainder of the semester, quarter, or class if high levels of action and trust reinforcement are maintained (Corpola, 2004).

Virtual team trust as pointed out by Pantelli & Duncan (2004) needs to develop quickly and it is imperative that it lasts all the way through the short duration of a project lifecycle (Pantelli & Duncan, 2004). Trust relationships are established, cultivated, developed, nurtured, and maintained among team members through positive and rewarding interaction with one another in their virtual environment (Pantelli & Duncan, 2004). In addition, empirical studies provide support of the existence of swift trust in successful and effective virtual teams (Corpola et al., 2004; Jarvenpaa & Leidner, 1999). In virtual teams that exhibit swift trust, trust is very fragile, temporal, and dependent upon the initial communication behavior between its team members (Jarvenpaa & Leidner, 1999). Also, the coordinator role on a virtual team is of particular importance in order to establish swift trust, early communication, and social atmosphere among his or her team members (Corpola et al., 2004). The swift trust paradigm suggests that, when virtual teams do not have enough time to slowly develop trust, teammates assume that

others on their team are trustworthy and begin collaborating as if trust was already in place while seeking to confirm or disconfirm evidence throughout the duration of an assignment or project (Meyerson et al., 1996; Powell et al., 2004).

Swift trust according to Hung et al., (2003) is conferred ex ante and therefore presumptively it enables virtual team members to manage issues of vulnerability, uncertainty, risk, in cases in which trusting relationships are missing or lacking. In addition, role-based interaction, instead of person-based interaction, and the use of category driven information processing, instead of evidence-driven information processing contributes to the rapid growth and development of trust in temporary systems. Temporary systems are frequently constructed utilizing people who represent a variety of specialties (Meyerson et al., 1996). Presumptive trust according to Hung et al., (2003) explains the high levels of trust observed in virtual team settings in which history and personal based information and knowledge are not available. When people first are introduced, there is a lack of personal knowledge associated with the interaction of the parties that tends to hinder team member's ability to engage in assessment deliberately, even when individuals have an elevated motivation to do so. This dilemma forces virtual team members to utilize simple heuristics associated with the peripheral cues entrenched in the interaction of the virtual environment. Therefore, information and knowledge like the interacting party's organizational roles and social categories and the norms of an organization become dominant in the formation of trust. People in newly created teams are inclined to rely on category-driven information processing in order to presume trust (Hung et al., 2003). A requirement of virtual teams trust states, Kanawattanachai and Yoo (2002) is that it must be built swiftly at the outset of a team's formation.

Virtual Team Collaboration and Cooperative Behavior

Collaboration in virtual teams involves decision-making among interdependent teammates involving a united ownership for decisions and collective responsibility for team outcomes (Peters & Manz, 2007). Team collaboration is the product of the existence of team member support for innovation, experimentation, and mutual conflict resolution in a virtual team (Peters & Manz, 2007; Aram & Morgan, 1976). Through importing new skills, competencies, mindsets, and corporate architectures it is effective for developing and enhancing collaboration in virtual teams. A need or desire to solve a problem, create, or make a discovery is the result of purposeful collaboration virtual team's process (Peters & Manz, 2007; Schrage, 1990).

Virtual teams according to Wells (2006) are organizational forms (organizations), frequently distributed (space), that collaborate synchronously (time) with team members in different locations (Wells, 2006). Virtual teams work interdependently transverse boundaries by utilizing information technology to facilitate to collaborate and communicate with one another (DeRosa et al., 2004). Trust is a significant factor says, Erdem et al., (2003) that underpins cooperative behaviors that are effective and therefore has a significant impact on the effect of change processes and risks (Shockley-Zalaback et al., 2000). A virtual team's members frequently use collaboration technologies in order to facilitate communication and collaboration across organizational, time, and geographic and boundaries (Duarte & Snyder, 1999; Hung et al., 2003).

In order for virtual teams to be successful says Kanawattanachai (2002) they need to be equipped with electronic collaborative systems and processes that will permit teammates to transverse geographical, temporal, and psychological distances (O'Hara-

Devereaux & Johansen, 1994). Business environments according to McFadzean (2001) are being progressively transformed by the use of the virtual teams and communication technologies. This shift towards capability enables virtual professionals to collaborate by participating from all corners of the world and at any time, both day and night. Virtual teams are utilizing virtual environments and the dynamics of the Internet, in order to communicate and deliver their communications. Virtual teaming consequently can take place at any time no matter where the team members are geographically located (Hislop, 1997; McFadzean, 2001). Consequently it has inspired the growth of teamwork in organizations and increased geographic dispersion (Lipnack & Stamps, 2000; Snow, Lipnack, & Stamps, 2001). Although communication technologies advancements might significantly enhance the facilitation of virtual team collaboration and ultimately boost team performance, it is imperative for teammates to cultivate strong interpersonal dynamics and mechanisms for support. This is because even the most advanced and sophisticated information and communication technologies only partly contribute to the success of these teams (Lurey & Raisinghani, 2001). In addition, virtual teams work collaboratively while being networked together on different floors, buildings, cities, and continents and at times. Members of virtual team work more than 50 feet from one another, is known as the fifty-foot rule of collaboration (Hugli, 2000; Lipnack & Stamps, 1997).

Trust Enhanced Collaboration and Cooperative Behavior

Virtual team collaboration is a challenging and very complex activity. These virtual business teams have requirements that include working collaboratively, communicating, mutually supporting one another, and sharing information. However, the

approaches and technologies required to achieve effective online collaborative business networks is alien to most organizations and cultures (Virtual teams' doorway to effective collaboration, 2009). Hence, the foundation of collaboration is trust and it is built and developed with promises (Promises: Roots of business, promises yield trust; trust yields results, 2008).

Due to the advent of collaborative work in virtual teams, states Peters and Manz (2007) direct control is no longer possible (Knights et al., 2001). The extent team member familiarity with their teammates prior to working together on a project team might have a significant impact on the level of team collaboration by directly affecting the ability of individuals on the virtual team to trust each other (Peters & Manz, 2007). Therefore, trust has been identified as the most important ingredient in the success of teams (Hacker, 2005; Lencione, 2002; Lu et al., 2006; Walther & Bunz, 2005).

In a virtual environment stated Araujo (2004) where people are located geographically distant from one another and interact only through the use of technologies, group interaction and results could be effected due to communication and distance constraints like collaboration difficulties, lack of social presence, low levels of immediate feedback, social loafing, and communication set within particular contextual constraints (Daft & Lengel, 1984; Lewicki & Bunker, 1995, p. 133; Lipnack et al., 2000; O'Hara-Devereaux et al., 1994).

Trusting work relationships according to Gehrke-Walters (2004) have a significant influence on cooperation, reduction in conflicts, and an increased commitment to the team or organization (Morgan & Hunt, 1994). Team members that trust each other are likely to sacrifice their personal objectives for the collective good of their team, thus

increasing collaboration amongst their team. The potential benefits derived from the use of teams may be dependent upon the element of trust that facilitates teamwork success (Larson & LaFasto, 1989; Serva and Fuller, 2004).

Pantelli and Duncan (2004) said that trust is a confident and positive expectation of the behavior of another individual or group enabling cooperation and it is the means for the reduction of complexity even in cases where people must act or behave under conditions of uncertainty with incomplete and ambiguous information (Cook & Wall, 1980; Currall & Judge, 1995; Kramer & Tyler, 1996; Luthans, 1992; Mayer et al., 1995). Trust is a salient and basic factor associated with the effectiveness of collaborative relations (Gefen, 2002; Kirkman et al., 2002; Koeszegi, 2004).

Trust is a multi-component variable says Costa (2003) with distinct but related dimensions that include perceived trustworthiness, the propensity to trust others, cooperation, and the absence of monitoring behaviors. There is an emphasis on coordination, the sharing of responsibilities, and participation in the decision processes associated with collaborative approaches to work teams (Keen, 1990).

The trust construct has been identified as a key success factor in team collaboration. Also, collaborative teams with trust at high levels are better positioned to position themselves to take action effectively, successfully, and strategically to adapt and compensate for changes in technologies or economic conditions. In today's changing business world it is imperative to constantly update one's appreciation of trust and its development. Trust is the fundamental foundation upon which team members can build profitable and success oriented collaborations (Herzog, 2001; Marks & Mirvis, 1998). Typically, the people who trust their colleagues also strongly perceive them as being

trustworthy, have a high propensity to trust others, frequently engage cooperative behaviors, and do not monitor their work (Costa et al., 2001).

Literature Review Summary

Trust is critical for stable social relations between team members (Blau, 1964, p.64). The literature revealed several essential trust and collaboration building or inviting approaches available to virtual teams. These team development processes when used in a correct fashion, can be very effective in creating ongoing trusting relationships and enhanced collaboration that invite and promote a positive business process between individuals on virtual teams.

The literature also brings to light a more in depth knowledge associated with the factors trust and collaboration that have an influence or impact on virtual team relations. Therefore, the development of these variables can ultimately serve to create a rewarding, win-win scenario for anyone that may employ them. Additionally, this quantitative method research study will contribute to the field of business and education by providing valuable insight and knowledge necessary for greater insight and understanding of trust and collaboration associated with geographically dispersed virtual teams. It will also provide an awareness of these critical variables that may be helpful in guiding others to be more trusting and collaborative in their interactions and relations with their virtual teammates.

The literature review revealed that there is growing interest in virtual team dynamics and the key variables associated with their interpersonal interaction. Although there has been a lot of research on the topic of virtual teams, and many different authors have addressed the factors of trust and collaboration associated with virtual teams, there

is still more research needed in order to bring the knowledge to full light. While numerous articles and dissertations exist on the various topics associated with virtual teams, trust, and collaboration, there is little discussion of them in relation to one another. In addition, because of the increase in geographically dispersed virtual teams on a rise and the importance of trust and collaboration to increase the success and productivity of these teams, it is essential to discuss these topics in union.

Therefore, there is a gap in what is known about these factors and their impact on geographically dispersed virtual team relations. Subsequently, there remain many unanswered questions in regards to how trust and collaboration actually influence virtual team relationships and their ability to be productive and successful. The results of this exploratory study are of particular interest because to date there has been no study that specifically investigates the relationship between trust and collaboration and these factors influence on the success and productivity of virtual teams. This unrealized opportunity provides the basis for this study and an avenue for the contribution of valuable knowledge on virtual teams.

CHAPTER 3. METHODOLOGY

Introduction

The purpose of this quantitative method study was to examine and compare the relationships between trust, collaboration, productivity, and success in virtual teams. This investigation was aimed at gaining understanding, from a virtual team member's perspective, how trust and collaboration have an impact on virtual team relations, productivity, and success. Additionally, this study explored how virtual teams and these factors are interrelated.

Research Design

This cross-sectional study with descriptive correlation design incorporates a quantitative methodology that was selected in order to gain knowledge and understanding in order to be able to explain and predict the relations between the study's variables of trust, collaboration, productivity, and success in virtual teams. This research utilized a non-experimental fixed design and a systems approach to investigate the relationships between the variables of focus in this study. The research participants with knowledge and experience with geographically dispersed virtual teams and related trust and collaboration took part in this study's quantitative survey. In doing so, it enabled the researcher to explore and quantify these variables in depth and gain an understanding and perspective of those virtual team members directly impacted by these key variables.

A correlation study design can be very effective for explaining the relationships among variables. In addition, correlational research seeks to discover the effects that a variable has on another, or others, or why certain outcomes are obtained. It is grounded in the logic of hypothesis testing that can generate inductive conclusions. The testing of correlational hypotheses is accomplished through measuring the co-variation among variables, ensures that other factors do not confound the explanatory relationships, and by determining the time order relationships among the variables (Cooper & Schindler, 2003). Relational cross-sectional fixed designs measure the relationship between variables and all of their measures are taken over a short period of time (Robson, 2002).

This study accessed and compared the participant's input regarding their current knowledge and perceptions associated with the factors of trust and collaboration in virtual teams. The aim of this quantitative method and explanatory research study was to use a systems approach with a correlational fixed design to understand, explain, and predict the relationships between trust and collaboration and their influence on productivity and success in virtual teams. This research study also explored the interaction between individuals on virtual teams and what impact the variables of trust, collaboration, and virtual teammates co-operative behavior has upon those relationships.

According to Arbnor and Bjerke (1997) the systems approach paradigm postulates that the world can be described piece by piece, as a gathering of systems. Additionally, in the systems approach the quality of reality is that reality has characteristics in which the whole differs from the sum of the parts. In this approach, knowledge depends upon systems, and the elements are understood and explained by the attributes of the whole. This creates a condition in which both the parts and the relations are essential and their

combined effect can lead to synergy. The objectives of the system approach are to identify the type of system, to describe and determine relations, and to be able to predict and guide relationships. Therefore, for this study, this approach worked great for searching out ideas associated with how certain behaviors and characteristics of real systems can be concentrated. Additionally, the quantitative method and its fixed design aided in exploring the correlational conditions that influence phenomenon related to this research.

Correlation research investigates the relationship and the degree of association between a study's variables. Correlation studies are frequently used to develop or build theories about performance. On the other hand, there is a major caveat; no matter how high the correlation is between a set of variables, one cannot conclude that cause-and-effect relations exists. Correlation research does not permit for an analysis of cause and effect or allow for a determination of causation. Correlation studies involve only the collection of quantitative data on two or more sets of variables (Cipani, 2009). These studies look for relationships between variables. They investigate whether there is a relationship between variables x and y . These studies can illuminate the relationships between variables. Interrelationship studies trace relationships among the facts obtained to gain a deeper insight into the situation. Correlation determines the extent of the relationship between two or more variables. Descriptive research is used to obtain information concerning the current status of the phenomena to describe what exists with respect to variables (Kay, 1997).

This research study's attributes consist of a cross-sectional, fixed, and a descriptive correlation design. Additionally, the study included using a quantitative

survey instrument, it incorporated a systems approach, and it utilized a survey methodology. The study's research hypotheses were tested through using descriptive statistics, Chi-Square test of Independence, and T- test procedures.

Sample Design

The focus of this research study targeted individuals that used online communications to participate in geographically dispersed virtual teams. The population, sampling method, and sample size and characteristics are presented as follows:

Population

The population of this study's research was selected from business professionals involved in virtual groups. In doing so, it increased the representation of knowledgeable and experienced people associated with virtual teams. The study's participants were solicited from public business directories that list business professionals that interact through the use of virtual teams. The respondents for this study resided in several states within the United States of America (USA). This population was targeted because the participants most likely will have some knowledge and experience of factors of trust and collaboration in geographically dispersed virtual teams. Therefore from this pool of business virtual team professionals, the participants were able to provide their opinions and perceptions on the factors of focus in this study as well as on the virtual team construct.

Sampling Method

A stratified sampling method can be used in order to increase the study's statistical efficiency, provide adequate data for analyzing the various subpopulations, and to enable different research methods and procedures to be used in different strata. It is

also a useful in order to study the characteristics of specific population groups. Typically a stratified sampling is selected when different methods of data collection are used. In doing so, it is possible to create an accurate sample in which there is little or no bias or systematic variances. Also, a sample with adequate precision is one that has a sampling error within acceptable limits of the study. (Cooper & Schindler, 2003). For the quantitative sampling method the prospective business professionals were divided by gender. Then a random sample was taken within each stratum. The sampling results were then weighted and combined into appropriate population estimates.

Sample Size and Characteristics

Statistically significant results with a normal distribution can be achieved by using a large enough sample for the quantitative portion of this study. The total population consisted of 400 business professionals located in the United States of America. The names and e-mail addresses of the potential participants were obtained from online public directories. In addition, in order to achieve a 95% confidence level with a confidence interval or a margin of error of 5, a sample size of 196 participants were needed in order to obtain a minimum of 120 surveys returned. The virtual team members to participate in the research study were selected from this pool of business people. They also had to meet specific criteria in order to participate in the quantitative questions research survey for the study's data collection. The criteria to participate in the survey included: a). must be a virtual team member residing in the United States of America, b). must have participated on a virtual team or have knowledge of virtual teaming, and c). must agree to respond to the study's survey.

Recruitment

The recruitment approach for this study focused on business professionals located in various states throughout the United States that have participated on virtual teams within the past year and were researcher driven. This study's participants were not supported by a specific organization; therefore the researcher was solely responsible for recruiting the study's participants. These virtual team members were selected from a pool of business professionals listed in public business directories. Each study participant was required to have been a member of a virtual team or have prior knowledge of virtual teams before taking the questionnaire.

Research Hypotheses

This study hypothesizes that if trust is related to collaboration, then higher levels of trust will lead to enhanced collaboration in virtual teams. Similarly, if collaboration is related to trust, then higher levels of collaboration will generate greater trust in virtual teams. It is also hypothesized that if trust and collaboration are related to productivity, then higher levels of trust and collaboration will lead to enhanced productivity in virtual teams. Likewise, if trust and collaboration are related to success, then higher levels of trust and collaboration will lead to enhanced success in virtual teams. The following are the research study's null and alternative hypotheses:

Hypothesis HO1 (null): Trust in virtual teams is independent of collaboration factors.

Hypothesis HA1 (alternative): Trust in virtual teams is dependent on collaboration factors.

Hypothesis HO2 (null): Productivity in virtual teams is independent of collaboration factors.

Hypothesis HA2 (alternative): Productivity in virtual teams is dependent on collaboration factors.

Hypothesis HO3 (null): Productivity in virtual teams is independent of trust factors.

Hypothesis HA3 (alternative): Productivity in virtual teams is dependent on trust factors.

Hypothesis HO4 (null): Success in virtual teams is independent of collaboration factors.

Hypothesis HA4 (alternative): Success in virtual teams is dependent on collaboration factors.

Hypothesis HO5 (null): Success in virtual teams is independent of trust factors.

Hypothesis HA5 (alternative): Success in virtual teams is dependent on trust factors.

Instrument

The data for this research study was gathered using a questionnaire (Appendix C). The purpose of a survey methodology was to generalize about a population by surveying a random sample of adequate size so that inferences can be made about that population, such as attitudes, behavior, or characteristics. Additionally, a survey was the preferred type of data collection for this study, due the economy of its design, and its ability to infer attributes of a large population from a small group of people. In addition, attitudes and their perceptions can be illuminated through questionnaires. Additionally, the instrument was specifically designed to be easy to read and complete, thereby improving the questionnaire's response rate. In addition, the survey questions and their related contextual statements were selected from the literature based on a validated survey instrument and the associated theories of trust and collaboration and their influence on productivity and success in virtual teams.

Survey Design

The first section of the questionnaire was designed to evaluate the respondent's perception, knowledge and experience associated with trust as it relates to trust and collaboration in virtual teams. The second section identified demographics and invited comments on geographically dispersed virtual teams. A five-point Likert scale was used for the survey that took approximately 15 minutes to complete. The Likert-type scale was used as the survey instrument, consisting of survey ratings ranging from 1-5. The respondents were asked to rate each statement based on their knowledge, understanding and experience of trust and collaboration and the factor's influence of productivity and success of global virtual team relations. The study's quantitative research questions were designed to draw out optimum responses from the survey participants. In addition, the survey utilized in this research study had been previously validated by the research study of (Karpiscak, 2007). From which questions had been selected due to their relevance to this study. Additionally, this quantitative questionnaire was validated using a pilot study prior to administering the research surveys to the randomly selected participants.

Measures

This study used situation specific measures as opposed to general measures of trust and collaboration in order to gather the best data possible. The research questions were directed towards measuring the participant's interpretation of these variables and their implication in virtual team relationship development. In addition, the survey questions were aimed at exploring and measuring the different participant's perceptions associated with trust collaboration in virtual teams.

Variables

There were several important variables necessary to promote the positive interaction between virtual team members. Trust and collaboration were the dependent variables that were the focus on in this study. These variables can be influenced in a number of ways; therefore a variety of strategic questions had been selected in order to generate related data. The independent variables that were investigated are the factors productivity and success associated with virtual teams.

Data Collection

The research data was collected by a questionnaire administered by the researcher that incorporated a five-point Likert scale. This quantitative methodology was directed at investigating the participants' views, opinions, and beliefs associated with trust and collaboration in virtual team relationships.

Approval for conducting the research was obtained through each participant in this research study. For this study, the population from which the potential study participants were chosen is current business professionals residing within the USA and those with experience on virtual teams. They also were selected randomly from the total pool of e-mail addresses using a stratified sampling method. The candidates selected were provided written instructions for the survey and were asked to submit the survey to the researcher. Additionally, those that took part in the study were provided an informed consent form (Appendix A) in which they had the opportunity to indicate their desire to participate in the study. In addition, the purpose of the inquiry, the specific and general information required, their role in the study, and the how the data would be used were stated in the form. The research cover letter (Appendix B) along with a link to the study's

questionnaire (Appendix C) was sent to participants via e-mail. Special questions on the survey were used to collect identifiable private socio-demographic, self-reported data, attitudes, and perceptions on the factors of trust and collaboration in virtual teams and other an associated phenomena. As such, these participants were provided the right to privacy and afforded the respect they deserved as an individual. Respondents were told that their responses would be confidential and that others would not view their individual surveys. Moreover, the researcher would retain ownership of the surveys and they would remain in the researcher's possession at all times. A signed statement of confidentiality and non-disclosure were provided to all subjects who have affirmed their participation.

The collected data continues to remain with the researcher. In addition, in order to ensure participant confidentiality, a unique number was given to each returned survey. Also, a unique number was assigned to all of the forms of respondent identification. Plus, the return envelopes, or the reply e-mails were separated from the questionnaires. No further attempt to identify or examine any of the respondents has taken place due to the sensitive nature of the context of the study's research. Individual and raw data generated from the surveys remains anonymous. The surveys were coded for tracking purposes. In doing so, the researcher or others were not able to identify the respondent of any of the returned surveys, thus optimizing confidentiality and ultimately protecting the various participants.

Data Analysis

The quantitative data analysis was accomplished by testing the study's hypotheses using the statistical package for the Social Sciences, SPSS 19.0 statistical software and through the use of descriptive statistics to identify the central tendency of the variables.

The Chi-Square Test of Independence and *t* Tests with a significance level set at 0.05 was also administered. This was done to test the distribution of the categorical variables against the questions and hypothesis in order to investigate whether each category had a proportion of cases in the target population.

Validity and Reliability

Construct Validity & Reliability

The construct reliability and validity for this study was primarily related to the reporting of trust and collaboration attitudes and perceptions associated with the study's participants, and their relation to the questions provided. The self-reported responses to the quantitative questions were considered to have both face and construct validity and reliability. This was accomplished through the direct phrasing and clarity of the question statements and the survey's design limits for opportunities for misunderstanding. In addition, content validity and reliability were supported by response categories and questionnaire statements consistent in the literature and validated by the survey instrument and through the study's pilot testing.

Pilot Test

According to Cooper and Schindler (2003), pilot testing is intended to illuminate improper control of environmental or extraneous conditions, as well as, errors in the design (p. 433). It is also conducted to detect weaknesses in both the instrumentation and the design. Proxy data is also generated for selection of a probability sample for the research study (p. 86). Therefore, a pilot test of the instrument was conducted in order to establish validity and reliability. It was also used to bring out issues associated with administering the survey or with questions on the quantitative questionnaire. The pilot

testing was accomplished in one phase. The instrument was pre-tested by sending five (5) colleagues an e-mail link and invite to the study's online survey. Then the feedback gathered aided in refining the instrument and perfecting its presentation for the main distribution. The pretests were also useful for obtaining a preview of potential data and the categories that may be obtained.

Ethical Considerations

All data was collected in accordance with applicable Capella University, Federal, State, and local laws regarding informed consent and information policy. A complete disclosure of the research was provided to each of the participants in order to eliminate any conflict of interest. In addition, all the subjects were assured that their names would not be disclosed in order to insure confidentiality. The study's participants were requested to not disclose their name on the survey. Additionally, the questionnaire instruction sheets indicated that the business professionals had no obligation to complete the questions and would not suffer any kind of a penalty from their instructors or managers. The researcher wanted to ensure that the business professionals were providing their own opinions and were not subjected to any undue stress in (a) completing the survey or b) to picking any particular answer. The research study's survey questions were objective and directed at eliminating bias. Additionally, protection of the human subjects was maintained by providing fair treatment and privacy for each participant. They also had the opportunity to withdraw from the study at any time without any monetary, physical, or psychosocial repercussions. Respondents were also provided with the contact information of the researcher, the dissertation chairperson, and the Institutional Review Board for questions or concerns about the study. The participants were also assured that

their identities data would be kept confidential. All of the research data from this study will be destroyed after seven years.

Summary of Research Methodology

This chapter contains the methods used to conduct the study's survey and evaluate the perceptions of respondents with regard to trust and collaboration and their ability to influence productivity and success in geographically dispersed virtual teams. The study was conducted with a quantitative questionnaire and the results were input into SPSS 19.0 for analysis. The study's research questions and hypotheses were tested using descriptive statistics, One-Sample *t* Tests and the Chi-Square Test of Independence procedures.

The more that a researcher knows what he or she wants to know, the more efficiently he or she will obtain what they need (Booth et al., 2003). This chapter contains the methods used to research and evaluate the perceptions of business professionals with regard to the factors of trust and collaboration in virtual teams. The topics of generalization, validity, and reliability of the study were discussed to provide clarity. The study's sample and participant selection was also addressed. In addition, the data collection procedures were presented. The survey process was presented along with a review of the pilot test and related documentation. The ethical considerations associated with the research were also discussed and detailed.

This study gathered correlation data in order to investigate the relationships between trust and collaboration and their influence on success and productivity in a geographically dispersed virtual team context. A quantitative correlational design was appropriate because the study was aimed at explaining the relationships between the

variables and does not attempt to prove the relations. Through utilizing a quantitative research methodology it was hoped that it would provide information-rich data that may add to and enhance knowledge and understanding of trust and collaboration and their influence on productivity and success in virtual teams.

CHAPTER 4. DATA COLLECTION AND ANALYSIS

Introduction

In this chapter there will be a discussion of the data collected, the participants and demographics, along with a presentation of general data. Data analysis and procedures will also be presented with the study's research questions and hypotheses testing. The study's additional questions will be discussed, as well as, a summary of the chapter. Virtual teams have become a standard of global and domestic business; however, one of the most significant issues confronting virtual work groups is trust. Therefore, a primary problem in virtual communities is getting virtual team members to trust and collaborate with one another. This research addresses the lack of research on trust and collaboration in a virtual context and it investigates the perceived influence of these key relations factors on productivity and success of virtual teams.

Data Collected

The purpose of this descriptive correlational research study was to understand, explain, and predict the controlling relationships among the variables of trust and collaboration and their influence on the productivity and success of virtual teams. The study's participants were asked to complete a Virtual Team survey instrument on the internet consisting of 64 questions. The questionnaire was administered online to 400 business professionals residing in the United States of America using the interactive survey features available through zoomerang. The first two questions screened to ensure

participants had been on a virtual team within the past year. From those that agreed with the privacy act, a total of 211 business professionals completed the survey.

The research was conducted using a quantitative survey methodology in order to access and compare the business professional's input regarding their current knowledge and perceptions associated with the factors of trust and collaboration in virtual teams. The aim of this descriptive research study was to use a systems approach with a descriptive correlational design to examine and compare the relationships between trust, collaboration, and perceived productivity, and success in a virtual team context. This research serves as a foundational work for exploring the relationships of trust and collaboration and their perceived influence on productivity and success in geographically dispersed teams.

Participants and Demographics

Approximately 400 potential participants were included in this research study from which 211 people participants responded to the questionnaire, providing a response rate of 52.75%. The demographic data gathered indicates that the survey's participants were predominately male at 58% or 123 and 42% or 88 females of those that responded. The age range was between 18 and 65 and older with the majority of participants being between 25 and 54 years of age. The education level of participants was made up of the following percentages: 12% were high school graduates, 13% had an associate's degree, 44% had a bachelor's degree, 26% had a master's degree, and 5% had a doctoral degree. The racial background of the participants was predominately White at 75%, Asian/Pacific Islanders were 11%, Hispanic at 5%, Black were at 4%, American Indian at 1%, and 5% declined to answer.

The various participants were representative of 37 or 74% of the states throughout the United States of America. Among those locations, respondents resided in the following states: Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Texas, Utah, Virginia, Washington, Washington DC, and Wisconsin.

General Data

There were 20 or 9% of the study's participants that had served in the United States Military Services. In general 82% of the participants said that they were comfortable using a computer. Of the 211 respondents 64% said that they generally prefer to work on a virtual team and the other 39% said that they preferred to work on a co-located team where they would meet face to face. From those that responded 54% said that they conduct meetings, teleconferences, or video conferences on a regular basis. In addition, 28% people stated that they held their meetings as they needed to on an ad hoc basis, where as 14% only had meetings initially, and only 8% did not hold any meetings. The participants that met face to face did so as follows: 27% met quarterly, 20% met monthly, 16% met weekly, 3% met daily, and 12% met only as necessary.

The participants addressed how long they had been with their organizations as follows: 24% had been with their firm less than a year, 42% for 1 to 5 years, 17% for 6 to 10 years, 7% for 11 to 15 years, 2% for 16 to 20 years, 2% 21 to 25 years, 1.4% for 26 to 30 years, 3% for 31 to 40 years, and 1% for over 41 years. The respondents were also

asked how long their virtual team had been in existence in which 48% stated their teams were less than a year old. In addition, 30% of the other respondents said their virtual teams were between one and two years old. While another 15% of the participants said their teams were between three to five years old. An additional 4% stated that their virtual teams were 6 to 10 years. Only two participants said their teams were older, indicating 18 years and 33 years old. The study's participants were asked how long they had been a member of the virtual team they were rating and responded as follows: 50% were members less than a year, 34% were members one to two years, 13% were members three to five years, 2% were members 6 to 10 years, and two participants said they were members 13 and 33 years.

The number of members on the participant's virtual teams ranged from two to 399 and were as follows: 33% of the teams had two to five members, 34% of the teams had 6 to ten members, 22% of the teams had 11 to 20 members, 9% of the teams had between 21 and 50 members, 1% of the teams had 51 to 100 members, and another 1% had between 101 and 399 members. The amount of experience of the virtual team's members ranged from no experience to 60 years of expertise. Where 46% of the members had less than a year of experience on a virtual team, 36% had two to five years, 10% had 6 to 10 years, 5% had 11 to 20 years, and 2% had the greatest experience. The teams with the most experience had 25, 33, 40, 53, and 60 years of virtual team experience. There were 158 or 75% of the team members that had been a member of their virtual team since their team's beginning. Additionally, the participants described their project: 19% stated their project as just getting started (about 0% complete), 22% said their project is underway (about 25% complete), 17% indicated their project was midway (about 50% complete),

12% were nearing completion (about 75% complete), 11% were almost finished or finished (about 100% complete), 20% stated that their project was ongoing (is continual – does not have an end point), while 6% said that they have never participated in a virtual team or on a virtual project.

Data Analysis and Procedures

The ordinal data from the research survey's Likert scales were reduced to the nominal level by combining all the *strongly agree* and less than *strongly agree* responses into two categories of "Positive" (Coded 1) and "Negative" (Coded 2). This grouping is based on the premise that any response that is less than the highest category is indicative of doubt on the part of the respondent, and this research study above all is focused on integrity and accuracy of ratings. A common statistical procedure utilized after this conversion is the nonparametric Chi Square Test of Independence. The data collected through the online survey was then imported into SPSS 19.0 for quantitative analysis. The descriptive statistics generated were used to identify the central tendency of the variables. Additionally, *t* Tests and the Chi Square Test were conducted to determine the statistical significance of each of the research questions and hypothesis presented in the questionnaire. In this study, a minimum significance level of .05 was used for each of the tests conducted. If the differences were statistically significant, the results would have occurred by chance less than 5 times in 100. In these cases the statistics were reported as $p < .05$. When the statistical difference was very strong, the *p* value was reported as $p < .01$, this means that the statistical results would have occurred by chance less than 1 time out of 100. If there was no significant difference in the data, the actual *p* value was reported.

Research Questions

This study utilized five research questions to investigate the factors of trust and collaboration and their relationship to perceived productivity and success in virtual teams.

The following research questions have been examined in this study:

1. What is the relationship between perceived trust in virtual teams and collaboration factors?
2. What is the relationship between perceived productivity in virtual teams and collaboration factors?
3. What is the relationship between perceived productivity in virtual teams and trust factors?
4. What is the relationship between perceived success in virtual teams and collaboration factors?
5. What is the relationship between perceived success in virtual teams and trust factors?

Hypotheses Testing

This research study addressed five research questions through the development of relevant hypotheses. Statistical techniques were administered to either support or not support a total of 5 hypotheses. This study hypothesizes that if trust is related to collaboration, then higher perceived levels of trust will lead to enhanced collaboration in virtual teams. Similarly, if collaboration is related to trust, then higher levels of collaboration will generate greater perceived trust in virtual teams. It is also hypothesized that if trust and collaboration are related to productivity, then higher levels of trust and collaboration will lead to a perceived enhancement of productivity in virtual teams. Likewise, if trust and collaboration are related to success, then higher levels of trust and collaboration will lead to a perceived enhancement of success in virtual teams. The following are the research study's null hypotheses:

Hypothesis HO1 (null): Trust in virtual teams is independent of collaboration factors. (Refer to survey question 27). This hypothesis was evaluated by comparing responses to question 27 using a Likert scale of 1 to 5; trust in virtual teams is independent of collaboration factors. The rater's perceptions of Hypothesis HO1 were as follows: A total of 211 or 100% participants responded to the question. There were 11 or 5% that strongly disagreed; 71 or 34% that disagreed; 48 or 23% that were undecided; 61 or 29% that agreed; and 20 or 9% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.04; Median = 3; Mode = 2; Range = 4; Standard Deviation = 1.1; Standard Error = 0.08; Confidence Interval @ 95% = 2.89-3.19. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are "positive" (coded as 1) and less than *strongly agree* are "negative" (coded as 2). The cross-tabulation for hypothesis HO1 (null) and transformation into coding resulted in 20 positive and 191 negative responses. The Chi Square Test and *t* Tests for Hypothesis HO1 (null) had a p-value equal to 0.000, which is less than 0.05, the hypothesis was rejected. It can be concluded that trust in virtual teams depends on collaboration factors.

Hypothesis HO2 (null): Productivity in virtual teams is independent of collaboration factors. (Refer to survey question 29). This hypothesis was evaluated by comparing responses to question 29 using a Likert scale of 1 to 5; productivity in virtual teams is independent of collaboration factors. The rater's perceptions of Hypothesis HO2 were as follows: A total of 211 or 100% participants responded to the question. There

were 16 or 8% that strongly disagreed; 74 or 35% that disagreed; 44 or 21% that were undecided; 55 or 26% that agreed; and 22 or 10% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.97; Median = 3; Mode = 2; Range = 4; Standard Deviation = 1.16; Standard Error = 0.08; Confidence Interval @ 95% = 2.81-3.12. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The Chi Square Test and *t* Tests for Hypothesis HO2 (null) had a p-value equal to 0.000 which is less than 0.05, the hypothesis was rejected. As a result, it can be concluded that productivity in virtual teams is dependent on collaboration factors.

Hypothesis HO3 (null): Productivity in virtual teams is independent of trust factors. (Refer to survey question 31). This hypothesis was evaluated by comparing responses to question 31 using a Likert scale of 1 to 5; productivity in virtual teams is independent of trust factors. The rater’s perceptions of Hypothesis HO3 were as follows: A total of 211 or 100% participants responded to the question. There were 17 or 8% that strongly disagreed; 62 or 29% that disagreed; 49 or 23% that were undecided; 55 or 26% that agreed; and 28 or 13% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.07; Median = 3; Mode = 2; Range = 4; Standard Deviation = 1.19; Standard Error = 0.08; Confidence Interval @ 95% = 2.91-3.23. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive”

(coded as 1) and less than *strongly agree* are “negative” (coded as 2). The Cross-tabulation for Hypothesis HO3 (null) and transformation into coding resulted in 28 positive and 183 negative responses. The Chi Square Test and *t* Tests for Hypothesis HO3 (null) had a p-value equal to 0.000, which is less than 0.05, the hypothesis was rejected. It can be concluded that productivity in virtual teams is depends on trust factors.

Hypothesis HO4 (null): Success in virtual teams is independent of collaboration factors. (Refer to survey question 33). This hypothesis was evaluated by comparing responses to question 33 using a Likert scale of 1 to 5; success in virtual teams is independent of collaboration factors. The rater’s perceptions of Hypothesis HO4 were as follows: A total of 211 or 100% participants responded to the question. There were 19 or 9% that strongly disagreed; 78 or 37% that disagreed; 37 or 18% that were undecided; 53 or 25% that agreed; and 24 or 11% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.93; Median = 3; Mode = 2; Range = 4; Standard Deviation = 1.2; Standard Error = 0.08; Confidence Interval @ 95% = 2.77-3.09. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The cross-tabulation for hypothesis HO4 (null) and transformation into coding resulted in 24 positive and 187 negative responses. Chi Square Test and *t* Tests for Hypothesis HO4 (null) resulted in a p-value equal to 0.000 which is less than 0.05, the hypothesis was rejected. As a result, it can be concluded that success in virtual teams is dependent on collaboration factors.

Hypothesis HO5 (null): Success in virtual teams is independent of trust factors. (Refer to survey question 35). This hypothesis was evaluated by comparing responses to question 35 using a Likert scale of 1 to 5; success in virtual teams is independent of trust factors. The rater's perceptions of Hypothesis HO5 were as follows: A total of 211 or 100% participants responded to the question. There were 14 or 7% that strongly disagreed; 69 or 33% that disagreed; 44 or 21% that were undecided; 61 or 29% that agreed; and 23 or 11% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.88; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.85; Standard Error = 0.06; Confidence Interval @ 95% = 3.76-3.99. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are "positive" (coded as 1) and less than *strongly agree* are "negative" (coded as 2). The cross-tabulation for hypothesis HO5 (null) and transformation into coding resulted in 23 positive and 188 negative responses. The Chi Square Test and *t* Tests for Hypothesis HO5 (null) had a p-value is 0.000, which is less than 0.05, the hypothesis was rejected. It can be concluded that success in virtual teams depends on trust factors.

Additional Research Questions

The research study's questionnaire asked participants to respond to a variety of questions associated with their perceptions. Included were questions on the factors of trust and collaboration and their influence on productivity and success in virtual teams (Refer to Appendix F). While the research hypotheses provided statistical evidence that the study's participants' perceptions indicated that trust and collaboration influenced

productivity and success in virtual teams. The data from the additional research questions was statistically significant in which several of the questions had a p-value equal to 0.000 which is less than 0.05, therefore as a result each of those questions were rejected. As a result, it can be concluded that many of the additional questions offered statically contradictory evidence. The data associated with the study's participants' perceptions of their teammates indicated that they were not very trusting of each other and they did not collaborate with one another on their virtual teams. Consequently, the statistical evidence pointed out that the raters' perceptions of their virtual team's productivity and success was also low. Therefore, these statistics highlight that although the research hypotheses indicated that high perceived levels of trust and collaboration, as well as, high levels productivity and success were ideals. That in reality lower levels of each of these four key factors was perceived by participants in their own virtual teams.

Summary

In this chapter, the Likert scale data collected from 211 participants from an online survey was subjected to a statistical analysis utilizing SPSS 19.0. The ordinal data from the research survey's Likert scales was reduced to the nominal level. Descriptive statistics were used to identify the central tendency of the variables. In addition, T-Tests and the Chi Square Test of Independence were conducted to determine the statistical significance of each of the research questions and hypothesis.

This study presented five research questions to investigate the perceptions associated to the factors of trust and collaboration and their relationship to perceptions linked to productivity and success in virtual teams. Five of the five hypotheses generated results that were statistically significant and were rejected. *Hypothesis HO1* - concluded

that trust in virtual teams depends on collaboration factors. *Hypothesis HO2* - concluded that productivity in virtual teams is dependent on collaboration factors. *Hypothesis HO3* - concluded that productivity in virtual teams is depends on trust factors. *Hypothesis HO4* - concluded that success in virtual teams is dependent on collaboration factors. *Hypothesis HO5* - concluded that success in virtual teams depends on trust factors.

Additionally, the results of this study concluded that many raters identified that there is a perceived significant relationship between trust and collaboration and the influence the variables have on virtual team interaction and their team member's ability to complete tasks and achieve team success. The data was statistically significant in which each of the hypotheses had a p-value equal to 0.000 which is less than 0.05, therefore as a result each of the study's null hypotheses were rejected. As a result, it can be concluded statistically that there is a perceived relationship between the factors of trust and collaboration in geographically dispersed virtual teams and the variables impact the interaction between virtual team members and the factors affect on productivity and the success of these teams. The participants pointed out that there is a significant relationship between trust and collaboration and the level of productivity and success in virtual teams. Therefore, according to the study's survey results there is a perceived significant positive relationship between collaboration and productivity and success in virtual teams.

The results of the hypotheses concluded that trust is perceived as dependent on collaboration as well as collaboration is perceived as being dependent on trust. In addition, productivity and success are perceived as being dependent on the variables of trust and collaboration. Raters also scored that there is a perceived importance to have a good working relationship with teammates, to work well with people who cooperate

effectively with one another, and to trust in team members. Additionally, the answers to these questions all illuminated that communication technologies, effective communication between teammates, collaboration, and the ability to work with diversity are all also important. The data collected also pointed out that team productivity, team success, and relationship development are perceived as important team assets.

However in reality, participants in the study provided significant data revealing that they thought that most people could not be trusted and they identified their virtual teams as not being trustworthy. Moreover, respondents did not believe that their remote team members tell the truth about the limits of their knowledge. The data showed that the respondents did not believe that their remote team members can be counted on to do what they say they will do or were honest in describing their experience and abilities.

Participants rated that they do not believe that their remote team members have high skills and ability. They also said that their remote team members all do not do their share of the work and they do not submit deliverables on time. The information gathered showed raters perceived their remote team members do not do their best and that they cannot depend on their team members. The data collected showed that the participants perceived that they could not depend on their remote team members. Finally, the data was significant in that it highlighted that virtual teams that trust and collaborate with one another do not necessarily have higher perceived productivity and more success.

CHAPTER 5. DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

This final chapter discusses the results of the research survey and the implications of its findings. The conclusions presented in this chapter will highlight this research's findings, their significance, and their potential contribution to the established body of knowledge. Finally, the chapter will conclude with a discussion for projected areas of future research.

This dissertation discussed and presented an analysis of the critical elements of trust and collaboration in virtual teams. Additionally, the study highlighted the competencies that effectively act to bring people together in virtual teams as well as invite positive interpersonal interaction among the parties involved. The research study was conducted using a quantitative survey methodology in order to access and compare business professionals residing in the United States of America's input regarding their current knowledge and perceptions associated with the factors of trust and collaboration in virtual teams. The aim of this descriptive research study was to utilize a systems approach with a descriptive correlational design in order to examine and compare the relationships between trust, collaboration, productivity, and success in a virtual team context. This research is intended to serve as a foundational work for exploring the relationships of trust and collaboration and their perceived influence on productivity and success in geographically dispersed teams.

An established survey instrument introduced by Karpiscak (2007) was modified into an instrument consisting of 64 research, demographic, and investigative questions that was used to determine ideals for trust and collaboration in virtual teams, as well as, to explore the present perceived levels of trust and collaboration in raters' virtual teams. In addition, the research was focused on investigating the perceived impact the factors of trust and collaboration have on productivity and success in virtual teams.

Findings and Data Interpretation

Approximately 400 potential participants were included in this research study from which 211 people participants responded to the questionnaire, providing a response rate of 52.75%. The demographic data gathered indicates that the survey's participants were predominately male at 58% or 123 and 42% or 88 females of those that responded. The age range was between 18 and 65 and older with the majority of participants being between 25 and 54 years of age. The respondents indicated that they had participated in one or more virtual team. In addition, the majority of the respondents considered themselves as members or leaders of virtual teams.

Research Questions

Virtual team trust is a very valuable asset, because it generates commitment, continuous improvement, cooperation, extra effort, and sharing of information and knowledge that can all propel a team to survive and achieve a competitive advantage. Thus, the effort to build a culture of trust is more than justified (Williams, 2008). This study intended to answer five research questions focused on the variables of trust and collaboration and their perceived influence on productivity and success in virtual teams. The implications from these research questions are as follows: (1) there is a significant

relationship between trust and collaboration and the influence the variables have on virtual team interaction and their team member's ability to complete tasks and achieve team success; (2) there is a significant relationship between the factors of trust and collaboration in geographically dispersed virtual teams and the variables perceived impact on the interaction between virtual team members and the factors perceived affect on productivity and the success of these teams; (3) there is a significant relationship between trust and collaboration and the perceived level of productivity of virtual teams; (4) there is a significant relationship between trust and collaboration and the perceived level of success of virtual teams; (5) there is a significant positive relationship between trust and perceived productivity and success in virtual teams; and (6) there is a significant positive relationship between collaboration and the perceived productivity and success in virtual teams.

Hypotheses

Five hypotheses were tested to answer the five research questions examining the factors of trust and collaboration and their perceived influence on productivity and success in virtual teams. Five of the five hypotheses generated results that were statistically significant and were rejected. *Hypothesis HO1* - concluded that trust in virtual teams is perceived as depending on collaboration factors. *Hypothesis HO2* - concluded that productivity in virtual teams is perceived as being dependent on collaboration factors. *Hypothesis HO3* - concluded that productivity in virtual teams is perceived as depending on trust factors. *Hypothesis HO4* - concluded that success in virtual teams is perceived as being dependent on collaboration factors. *Hypothesis HO5* - concluded that success in virtual teams perceived as dependent on trust factors.

Additional Research Questions

The survey also included questions that were collected as a comparison to prior studies and to serve as a basis for further research. The statistical data from these investigative questions illuminated the perceived importance of having a good working relationship with teammates. Respondents also reported that it is perceived as being important to work well with people who cooperate effectively with one another, and to trust in team members. In addition, these questions responses highlighted that communication technologies, effective communication between teammates, collaboration, the ability to work with diversity are all also important. The questions also pointed out that team productivity, team success, and relationship development are all perceived as being very important.

Despite the myriad of apparent benefits of collaborative virtual teams, it is difficult for their team members to achieve consensus and to share their opinions and beliefs (Tseng, 2008). Likewise, the answers to several of the questions responses were contrary to the reported data in the survey associated with ideals and goals linked to trust and collaboration and the factor's perceived impact on productivity and success in virtual teams.

Although the majority of the study's participants agreed that trust and collaboration were perceived as being important to virtual team productivity and success, in reality the raters painted a different picture of what was actually perceived as taking place in their virtual teams (Refer to the answers to the additional questions in Appendix F). The data's mixed conclusions that were significant are listed as follows: according to their perceptions, raters reported that most people on their virtual teams could not be

trusted, raters' statistically scored their teams as not being trustworthy, they do not believe that their remote team members tell the truth about the limits of their knowledge, and they do not believe that their remote team members can be counted on to do what they say they will do. Participants rated that they did not believe that their remote team members were honest in describing their experience and abilities, and the data showed that respondents did not believe that their remote team members had high skills and ability.

Relationship building, cohesion, and trust according to Powell, et al., (2004) are fundamental processes that foster team effectiveness, however virtual teams face tremendous difficulty in achieving them (Alexander, 2000; Kezsbom, 2000; Lipnack & Stamps, 2000; Solomon, 2001). As a result of the difficulty involved in accessing virtual teammates' trustworthiness without ever meeting them, trust development in virtual teams presents significant challenges (McDonough et al., 2001). Also according to their perceptions, the respondents reported statistically that their remote team members do not all do their share of the work because in a group project, members divide and share the work among each other. The data pointed out that participant's remote team members do not submit deliverables on time because it is known that a delay in completion will have a negative effect on their evaluation. Through their perceptions it was reported that it was that raters' remote team members do not all do their best because their instructors expect truth about limits of knowledge. In addition, respondents scored that they could not depend on their remote team members because they are their co-business professionals and being co-business professionals in a virtual team environment they are always dependable. Participants also perceived that they could not depend on their remote team

members because they will do their best to uphold the reputation of their organization. Moreover, the statistics from the additional questions illuminated that virtual team members that trust and collaborate with one another did not have higher perceived productivity and more success (refer to Appendix F).

Conclusions

The results of this quantitative research will provide researchers, managers, and leaders with insight and a perspective into virtual team interaction. This knowledge and statistics may contribute to higher perceived levels of trust and collaboration and greater perceived influence on productivity and success in virtual teams. This study's data may also aid in developing a better understanding of virtual teams and may potentially lead to increased perceived levels of trust and collaboration amongst team members.

There is a definite link between trust and effectiveness and efficiency of a virtual team (Karpiscak, 2007; Snow, Snell, & Davison, 1996). Virtual Teaming will progressively continue to become an important part of business and educational operations. In order to accomplish the virtual team's goals and excel to be productive and successful, team members must trust and collaborate with one another. While the data from this study provides an indication that the participants' perception was that trust and collaboration influenced productivity and success in virtual teams, caution must be used in drawing conclusions from this research. It must be pointed out that the data collected and the statistics only represent a small period of time, generated from a very specific population. Additionally, the data was volunteered, where the results may not be entirely representative of the sampled population, included the raters' perceptions, or may not have similar validity for other groups.

Recommendations for Future Research

Trust is the fundamental foundation upon which team members can build profitable and success oriented collaborations (Herzog, 2001; Marks & Mirvis, 1998). This study is representative of a provisional step into an area that has immense potential and can present great benefit to virtual team interaction. There is a multitude of possible directions this study can serve as bases for future research to follow. The possibilities are boundless for follow-on research. Thus, there are several basic recommendations or directions for future exploration and expansion on this knowledge. Future studies are invited to delve even deeper into the aspects of the variables of trust, collaboration, productivity, or success can yield important data to better understand the dynamics of virtual teams and the keys to developing relationships. In addition, it would also be beneficial to conduct similar studies in other countries or on international bases. Also, further quantitative and qualitative examination is needed to determine why there are low perceived levels of trust and collaboration in virtual teams, even though these factors are reported statistically as ideals for team interaction.

Further studies can also illuminate whether these lower perceived levels of trust and collaboration also exist in other populations or whether they systemic on a national or global scale. Similar research should be conducted among populations in the public and private sectors. Diversity studies could also be explored to examine other cultures to see if trust and collaboration have a higher perception in those populations and if those variables have a greater perceived influence on productivity and success in those groups or societies. Additional studies that bring out a deeper understanding of the dynamics of trust and collaboration should be explored for more in depth meaning. As well as, there

should be future studies concentrated on how to increase favorable perceptions of productivity and success in geographically dispersed virtual teams. The importance of trust and collaboration and their relation to successful and productive virtual teams warrant future research in general.

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APPENDIX A. INFORMED CONSENT FORM

Capella University
222 South 9th Street
20th Floor
Minneapolis, MN 55402

Informed Consent Document & Web-Based Privacy Act Statement

Note: The document below will provide the potential respondent with the information to meet the requirements of Capella University's Institutional Review Board on human research protections. Once the respondent arrives at the web-based survey home page and is welcomed to participate, this page will appear. In addition, this page will be required viewing by all respondents prior to beginning the survey and it will appear as written. It will not be possible for a potential respondent to skip reviewing the document prior to participation in the questionnaire.

(Text Begins)

The Privacy Act requires that you be notified of the purpose of the research survey and how the findings will be used. This page provides information about the Privacy Act and what Informed Consent is. Please read this document carefully!

Purpose of the Survey: Information collected in this survey will be used to research attitudes, perceptions, and thoughts associated with variables of trust and collaboration and their influence on productivity and success in virtual teams. This questionnaire is being conducted solely for research purposes as part of a student PhD dissertation. The information gained from this research will also help in providing greater insight, understanding, and knowledge of these variables and their impact on virtual team relationships. Some of the findings might be presented at conferences, or published in professional journals.

Statement of Risk: Participation in this survey is not expected to involve any risk or discomfort to you. The only risk to you is accidental or unintentional disclosure of the data you provide.

Survey Eligibility and Potential Benefits: You have been invited to participate in this survey because you may have been, are, or may shortly be participating in a virtual team, or at least have been exposed to the concept of virtual teaming. While there is no benefit

just for you for your individual participation, your answers on the survey will make a difference.

Confidentiality: In no case will the data be reported or used to identify individuals who choose to participate in the survey. The survey data will be kept strictly confidential and will be available only to myself as the researcher. In addition, under no circumstances will your name or the name of your firm be included in the research study's report. By using a code, such as participant A and company X, it will enable me to make any reference to you and your organization. The data will be stored at the researcher's home in a secure filing cabinet.

Point of Contact: If you have concerns about your rights as a research participant, cannot access the web-based questionnaire, or have any other problem with the survey, please e-mail Dale Cook at: awistiti@comcast.net or leave a message anytime at (925) 240-7598. My research supervisor (mentor) is Dr. John Machnic. He can be reached via e-mail at jamachnic@comcast.net. Capella University can be contacted at (888) 227-3552. A copy of the study will be made available upon request.

Voluntary Nature of the Research: Providing information on this survey is totally voluntary. Most people take 15-20 minutes to complete the survey. There is no penalty if you choose not to respond. However, maximum participation is encouraged so that the data will be complete and representative of the entire population. Your survey responses will be treated as confidential. Identifying information will be protected from disclosure and used only by the researcher for the purposes of this survey research. If you believe that your participation in the survey or your answers may cause you distress you may stop at any time and you will not be contacted for follow-up purposes.

By clicking you agree to participate in the survey. Click "continue", if you agree to take part in the survey.

(Text Ends)

Note: At this point, the respondent is shown the web-based security protection notification page.

Web-based Security Protection Notification

The researcher will not collect personal information about you when you visit this web site, unless you choose to provide it yourself in the course of the survey. If you volunteer any information, it will be treated as confidential. For more information about your privacy rights, please return to the Privacy Act Statement at the start of the survey.

Definition of a virtual team: groups of self-governing knowledge workers who share accountability for the completion of assignments, tasks, and projects, they are

geographically dispersed, and interact exclusively through information and communication technologies (Piccoli, 2000).

Purpose of this Survey: The information collected will provide greater insight, knowledge, and understanding of the factors of trust and collaboration and their influence on productivity and success of virtual teams.

APPENDIX B. INTRODUCTION LETTER TO PARTICIPANTS

Dale J. Cook Jr.
xxx@xxx.net
(111) 111-1111

March 2010

Dear Participant's Name:

I am writing to request your participation in a survey that I am conducting to investigate the perceptions of people working on virtual teams regarding trust, and collaboration in their teams. The survey is designed to be quick and easy. It should not take more than 10 minutes to complete.

Your participation in completing the survey is voluntary and confidential. There will be NO connection between your responses and your identity. All answers will be held in strict confidence.

Data collected from the survey will be used only for the purposes of my doctoral dissertation at Capella University. The aggregate results of this quantitative survey will be published in my doctoral dissertation. The survey results will also be available to participants from the researcher at xxx@xxx.net

The survey is located on the Internet. No download of data is required; you will answer the questions directly on the Internet. You may complete the survey only once.

To begin survey, please direct your browser to the URL listed below.

URL: <http://www.....>

By entering the survey site, you are expressing your willingness to participate in this survey and to have your responses included in this study.

If you have any questions or comments about the survey, please feel free to contact me at the e-mail address above. Thank you for agreeing to participate in this survey and for your time and assistance with this study!

Sincerely,

Dale J. Cook Jr.

APPENDIX C. SURVEY INSTRUMENT

The Privacy Act requires that you be notified of the purpose of the research survey and how the findings will be used. This page provides information about the Privacy Act and what Informed Consent is. Please read this document carefully!

Purpose of the Survey: Information collected in this survey will be used to research attitudes, perceptions, and thoughts associated with variables of trust and collaboration and their influence on productivity and success in virtual teams. This questionnaire is being conducted solely for research purposes as part of a student PhD dissertation. The information gained from this research will also help in providing greater insight, understanding, and knowledge of these variables and their impact on virtual team relationships. Some of the findings might be presented at conferences, or published in professional journals.

Statement of Risk: Participation in this survey is not expected to involve any risk or discomfort to you. The only risk to you is accidental or unintentional disclosure of the data you provide.

Survey Eligibility and Potential Benefits: You have been invited to participate in this survey because you may have been, are, or may shortly be participating in a virtual team, or at least have been exposed to the concept of virtual teaming. While there is no benefit just for you for your individual participation, your answers on the survey will make a difference.

Confidentiality: In no case will the data be reported or used to identify individuals who choose to participate in the survey. The survey data will be kept strictly confidential and will be available only to myself as the researcher. In addition, under no circumstances will your name or the name of your firm be included in the research study's report. By using a code, such as participant A and company X, it will enable me to make any reference to you and your organization. The data will be stored at the researcher's home in a secure filing cabinet.

Point of Contact: If you have concerns about your rights as a research participant, cannot access the web-based questionnaire, or have any other problem with the survey, please e-mail Dale Cook at: xxx@xxx.net or leave a message anytime at (111) 111-1111 My research supervisor (mentor) is Dr. John Machnic. He can be reached via e-mail at xxx@xxx.net. Capella University can be contacted at (888) 227-3552. A copy of the study will be made available upon request.

Voluntary Nature of the Research: Providing information on this survey is totally voluntary. Most people take 15-20 minutes to complete the survey. There is no penalty if you choose not to respond. However, maximum participation is encouraged so that the data will be complete and representative of the entire population. Your survey responses will be treated as confidential. Identifying information will be protected from disclosure and used only by the researcher for the purposes of this survey research. If you believe that your participation in the survey or your answers may cause you distress you may stop at any time and you will not be contacted for follow-up purposes.

Web-based Security Protection Notification The researcher will not collect personal information about you when you visit this web site, unless you choose to provide it yourself in the course of the survey. If you volunteer any information, it will be treated as confidential. For more information about your privacy rights, please return to the Privacy Act Statement at the start of the survey. **Definition of a Virtual Team:** groups of self-governing knowledge workers who share accountability for the completion of assignments, tasks, and projects, they are geographically dispersed, and interact exclusively through information and communication technologies (Piccoli, 2000). **Purpose of this Survey:** The information collected will provide greater insight, knowledge, and understanding of the factors of trust and collaboration and their influence on productivity and success of virtual teams.

Trust and collaboration, which is expressed as behavior, can be measured. * Measured by the ability to establish and enable relationships to develop and flourish through positive interaction between individuals and parties. In addition, trust and collaboration can be measured by their ability to generate productivity and success. * Thank you for agreeing to take part in this study. Additionally, before we start, I would like to emphasize that: Your participation is entirely voluntary, you are free to refuse to answer any question, and you are free to withdraw from the survey process at any time.

1. To participate in this research you must have been on a virtual team in the past year. Have you participated on a virtual team in the past year?

- 1 Yes
- 2 No

2. By clicking you agree to participate in the survey. Click "Yes", if you have been on a virtual team in the past year and you agree to take part in the survey.

- 1 Yes
- 2 No

Virtual Team Questionnaire Note: If you are presently working (or will work) on more than one virtual team, please choose only one team to rate during the course of this individual survey. There are a total of 64 questions on the survey and it will take approximately 15 to 20 minutes to complete.

3. My Virtual Project is?

- 1 just getting started (about 0% complete)
- 2 underway (about 25% complete)
- 3 midway (about 50% complete)
- 4 nearing completion (about 75% complete)
- 5 almost finished or finished (about 100% complete)
- 6 ongoing (is continual – does not have an end point)
- 7 I have never participated in a virtual team or virtual team project

4. We conduct meetings, teleconferences, or video teleconferences

- 1 only initially
- 2 on a regular basis
- 3 as we need to (ad hoc)
- 4 never

Please think of the ideal virtual team, disregarding your present team, if you are on one. In choosing an ideal virtual team, how important would it be to...

5. Have a good working relationship with your teammates

- 1 of utmost importance
- 2 very important
- 3 of moderate importance
- 4 of little importance
- 5 of very little importance

6. Work well with people who cooperate well with one another

- 1 of utmost importance
- 2 very important
- 3 of moderate importance
- 4 of little importance
- 5 of very little importance

In your virtual team, how important is each of the following to you?

7. Trust in team members

- 1 of utmost importance
- 2 very important
- 3 of moderate importance
- 4 of little importance
- 5 of very little importance

8. Communication technologies

- 1 of utmost importance
- 2 very important
- 3 of moderate importance
- 4 of little importance
- 5 of very little importance

9. Effective communication between teammates

- 1 of utmost importance
- 2 very important
- 3 of moderate importance
- 4 of little importance
- 5 of very little importance

10. Team collaboration

- 1 of utmost importance
- 2 very important
- 3 of moderate importance
- 4 of little importance
- 6 of very little importance

11. Ability to work with diversity

- 1 of utmost importance
- 2 very important
- 3 of moderate importance
- 4 of little importance
- 5 of very little importance

12. Team productivity

- 1 of utmost importance
- 2 very important
- 3 of moderate importance
- 4 of little importance
- 5 of very little importance

13. Team success

- 1 of utmost importance
- 2 very important
- 3 of moderate importance
- 4 of little importance
- 5 of very little importance

14. Relationship development

- 1 of utmost importance
- 2 very important
- 3 of moderate importance
- 4 of little importance
- 5 of very little importance

Questions 15-26 will ask you for information about the level of trust between virtual team members. Using a scale from 1-5, please answer the following questions: To what extent do you agree or disagree with each of the following statements?

15. Most people can be trusted

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

16. The members of my team are trustworthy

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

17. I believe that remote team members tell the truth about the limits of their knowledge

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

18. I believe that remote team members can be counted on to do what they say they will do

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

19. I believe that remote team members are honest in describing their experience and abilities

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

20. I believe that remote team members have high skills and ability

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

21. My remote team members all do their share of the work because in a group project, members divide and share the work among each other.

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

22. My remote team members submit deliverables on time because it is known that a delay in completion will have a negative effect on their evaluation.

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

23. My remote team members all do their best because their instructors expect truth about limits of knowledge

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

24. I can depend on my remote team members because they are my co-business professionals and co-business professionals in a virtual team environment are always dependable

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

25. I can depend on my remote team members because they will do their best to uphold the reputation of our organization

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

26. Virtual teams that trust and collaborate with one another have higher productivity and more success

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

Questions 27 thru 41 will ask you for information about the perceived level of trust and collaboration and their influence on productivity and success between virtual team members. Using a scale from 1-5, please answer the following questions: To what extent do you agree or disagree with each of the following statements.

27. Trust in virtual teams is independent of collaboration factors

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

28. Trust in virtual teams is dependent on collaboration factors

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

29. Productivity in virtual teams is independent of collaboration factors

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

30. Productivity in virtual teams is dependent on collaboration factors

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

31. Productivity in virtual teams is independent of trust factors

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

32. Productivity in virtual teams is dependent on trust factors

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

33. Success in virtual teams is independent of collaboration factors

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

34. Success in virtual teams is dependent on collaboration factors

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

35. Success in virtual teams is independent of trust factors

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

36. Success in virtual teams is dependent on trust factors

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

37. The factors of trust and collaboration in geographically dispersed virtual teams impact the interaction between virtual team members and affect productivity and the success of these teams

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

38. There a relationship between trust and collaboration and the perceived level of productivity of virtual teams

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

39. There a relationship between trust and collaboration and the perceived level of success of virtual teams

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

40. There a significant positive relationship between trust and productivity and perceived success in virtual teams

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

41. There a significant positive relationship between collaboration and productivity and perceived success in virtual teams

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

Questions 42 thru 47 will ask you for information about trust, collaboration and their influence on relations between virtual team members and their impact on the team's performance and success. Using a scale from 1-5, please answer the following questions: To what extent do you agree or disagree with each of the following statements?

42. Trust and collaboration influences virtual team interaction and their team member's ability to complete tasks and achieve team success

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

43. The factors of trust and collaboration in geographically dispersed virtual teams impact the interaction between virtual team members and affect productivity and the success of these teams

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

44. There is a relationship between trust and collaboration and the level of productivity of virtual teams

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

45. There is a relationship between trust and collaboration and the level of success of virtual teams

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

46. There is a significant positive relationship between trust and productivity and success in virtual teams

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

47. There is a significant positive relationship between collaboration and productivity and success in virtual teams

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

Questions 48 - 63 ask for general information about yourself, your virtual team, and your organization. Question 64 provides the opportunity to offer your own comments.

48. In general, I am comfortable at using a computer

- 1 strongly agree
- 2 agree
- 3 undecided
- 4 disagree
- 5 strongly disagree

49. Do you generally prefer to work with a virtual team or a co-located (i.e., face-to-face) team?

- 1 virtual team
- 2 co-located team

50. How long has the virtual team you are rating been in existence?

51. How long have you been a member of the virtual team that you are rating?

52. Have you been a member of the virtual team that you are rating since its beginning?

- 1 yes
- 2 no

53. How often does the entire virtual team meet in person (face-to-face)?

- 1 never
- 2 quarterly (or less often)
- 3 monthly
- 4 weekly
- 5 daily
- 6 only as necessary

54. Estimate the number of team members on your team

55. What is your age?

- 1 18-24
- 2 25-34
- 3 35-44
- 4 45-54
- 5 55-64
- 6 65 & older

56. Please state your gender

- 1 male
- 2 female

57. What country, city, and state are you located in?

58. How many months or years of virtual team experience do you have?

59. How many months or years have you been with your organization?

60. What is your highest Level of Education?

- 1 High School
- 2 Associate
- 3 Bachelor
- 4 Masters
- 5 Doctoral

61. Did you serve in a Military Service?

- 1 yes
- 2 no

62. If yes, what branch of the Military, what years?

63. What is your race? Please select one of the following categories that best describe your racial background.

- 1 decline to identify
- 2 White (not of Hispanic origin)
- 3 Black
- 4 Asian/Pacific Islander
- 5 American Indian/Alaskan Native
- 6 Hispanic

64. Comments

This modified questionnaire is from: The effect of new technologies on the performance of virtual teams by Karpiscak , 2007. Adapted with permission.

APPENDIX D. PERMISSION LETTER

Dale J. Cook Jr.
xxx@xxx.net
(111) 111-1111

March 2010

Dear Virtual Team Member/Potential Participant,

Hello my name is Dale Cook and I am writing to request your permission to distribute a survey that I am conducting to investigate the perceptions of business professionals working on virtual teams regarding trust and collaboration and the factors influence on productivity and success of the teams. The survey is designed to be quick and easy. It should not take more than 15 minutes to complete.

Student participation in completing the survey is voluntary and confidential. There will be NO connection between the participant's responses and their identity. All answers will be held in strict confidence. Data collected from the survey will be used only for the purposes of my doctoral dissertation at Capella University. The aggregate results of this survey will be published in my doctoral dissertation. The survey results will also be available to participants from the researcher at xxx@xxx.net

The survey is located on the Internet. No download of data is required; business professionals will answer the questions directly on the Internet. In addition, the students may complete the survey only once. To begin survey, potential participants will be directed to use their browser to navigate to the URL: <http://www...>

By entering the survey site, participants will be expressing their willingness to take part in this survey and to have their responses included in this study. Additionally, in order to distribute the questionnaire to business professionals, their e-mail addresses will be needed.

Therefore, this letter is to request permission to conduct research on trust and collaboration and their influence on productivity and success in virtual teams.

Sincerely,

Dale J. Cook Jr.

APPENDIX E. AUTHORIZATION LETTER

From: "John Karpiscak" <jkarpiscak@xxx.net> On: Feb 02/07/09 1:02 PM
To: xxx@xxx.net

Dale: Greetings!

Yes, you may use the survey questions for your dissertation. Congratulations on getting this far; you are part of a special group of people that is 3% of the world's population (or less) in the world as well as being an over-achiever. Good for you!

Good luck with your research and please let me know how things go; I am very much interested in your study and result. Should you need any other assistance, please contact me.

Dr. John Karpiscak

Jk3

APPENDIX F. ADDITIONAL SURVEY QUESTIONS

Procedure for Data Analysis

An analysis of the study's additional research questions utilized the ordinal data from the survey's Likert scales which was reduced to the nominal level by combining all the *strongly agree* and less than *strongly agree* responses into two categories of "Positive" (Coded 1) and "Negative" (Coded 2). This grouping is based on the premise that any response that is less than the highest category is indicative of doubt on the part of the respondent, and this research study above all is focused on integrity and accuracy of ratings. A common statistical procedure utilized after this conversion is the nonparametric Chi Square Test of Independence. The data collected through the online survey was then imported into SPSS 19.0 for quantitative analysis. The descriptive statistics generated were used to identify the central tendency of the variables. Additionally, *t* Tests and the Chi Square Test were conducted to determine the statistical significance of each of the research questions and hypothesis presented in the questionnaire. In this study, a minimum significance level of .05 was used for each of the tests conducted. If the differences were statistically significant, the results would have occurred by chance less than 5 times in 100. In these cases the statistics were reported as $p < .05$. When the statistical difference was very strong, the *p* value was reported as $p < .01$, this means that the statistical results would have occurred by chance less than 1

time out of 100. If there was no significant difference in the data, the actual p value was reported.

Additional Research Questions

Research Question 1 and 42: How does trust and collaboration actually influence virtual team interaction and their team member's ability to complete tasks and achieve team success? (Refer to survey question 1 and 42). This question was evaluated by comparing responses to question 42 using a Likert scale of 1 to 5; trust and collaboration influences virtual team interaction and their team member's ability to complete tasks and achieve team success. The raters' perceptions of Research Question 1 were as follows: A total of 211 or 100% participants responded to the question. There were 3 or 1% that strongly disagreed; 14 or 7% that disagreed; 30 or 14% that were undecided; 123 or 58% that agreed; and 41 or 19% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.88; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.85; Standard Error = 0.06; Confidence Interval @ 95% = 3.76-3.99. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are "positive" (coded as 1) and less than *strongly agree* are "negative" (coded as 2). The transformation to coding resulted in 41 positive and 170 negative responses. The Chi Square Test and t Tests for research question 1 and 42 had a p -value equal to 0.000 which is less than 0.05, thus the questions were rejected. As a result, it can be concluded statistically that there was a significant relationship between trust and collaboration and the influence the

variables have on virtual team interaction and their team member's ability to complete tasks and achieve team success.

Research Question 2, 37, and 43: How do the factors of trust and collaboration in geographically dispersed virtual teams' impact the interaction between virtual team members and affect productivity and the success of these teams? (Refer to survey questions 2, 37, and 43). This question was evaluated by comparing responses to question 2, 37, and 43 using a Likert scale of 1 to 5; the factors of trust and collaboration in geographically dispersed virtual teams impact the interaction between virtual team members and affect productivity and the success of these teams. The raters' perceptions of Research Question 2, 37, and 43 were as follows: A total of 211 or 100% participants responded to the question. There were 7 or 3% that strongly disagreed; 17 or 8% that disagreed; 39 or 18% that were undecided; 104 or 49% that agreed; and 44 or 21% that strongly agreed. The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.76; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.98; Standard Error = 0.07; Confidence Interval @ 95% = 3.63-3.90.

The raters' perceptions of Research Question 2, 37, and 43 were as follows: A total of 211 or 100% participants responded to the question. There were 5 or 2% that strongly disagreed; 15 or 7% that disagreed; 32 or 15% that were undecided; 120 or 57% that agreed; and 39 or 18% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.82; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.9; Standard Error = 0.06; Confidence Interval @ 95% = 3.70-3.94. Since *strongly agree* are the only responses that equate to a fully committed recommendation,

the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 44 positive and 167 negative plus 39 positive and 172 negative responses. When the codes were averaged they were equal to 41.5 positive and 169.5 negative responses. The Chi Square Test and *t* Tests for research questions 2, 37, and 43 had a p-value equal to 0.000, which is less than 0.05, therefore the questions were rejected. It can be concluded that statistically that there was a significant relationship between the factors of trust and collaboration in geographically dispersed virtual teams and the variables impact the interaction between virtual team members and the factors affect on productivity and the success of these teams.

Research Question 3, 38, and 44: Is there a relationship between trust and collaboration and the level of productivity of virtual teams? (Refer to survey questions 3, 38, and 44). This question was evaluated by comparing responses to questions 3, 38, and 44 using a Likert scale of 1 to 5; there a relationship between trust and collaboration and the level of productivity of virtual teams. The raters’ perceptions of Research Questions 3, 38, and 44 were as follows: A total of 211 or 100% participants responded to the question. There were 3 or 1% that strongly disagreed; 10 or 18% that disagreed; 39 or 18% that were undecided; 105 or 50% that agreed; and 54 or 26% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.93; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.87; Standard Error = 0.06; Confidence Interval @ 95% = 3.82-4.05. The raters’ perceptions of Research Questions 3, 38, and 44 were also as follows: A total of 211 or 100% participants responded to the question. There were 2 or 1% that strongly

disagreed; 14 or 7% that disagreed; 37 or 18% that were undecided; 116 or 55% that agreed; and 42 or 20% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.86; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.84; Standard Error = 0.06; Confidence Interval @ 95% = 3.75-3.98. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 54 positive and 157 negative plus 42 positive and 169 negative responses. When the codes were averaged they were equal to 48 positive and 163 negative responses. The Chi Square Test and *t* Tests for research question 3, 38, and 44 had a p-value equal to 0.000 which is less than 0.05, therefore the questions were rejected. As a result, it can be concluded that statistically that there was a significant relationship between trust and collaboration and the level of productivity of virtual teams.

Research Question 4, 39, and 45: Is there a relationship between trust and collaboration and the level of success of virtual teams? (Refer to survey questions 4, 39, and 45). This question was evaluated by comparing responses to questions 4, 39, and 45 using a Likert scale of 1 to 5; there a relationship between trust and collaboration and the level of success of virtual teams. The raters' perceptions of Research Questions 4, 39, and 45 were as follows: A total of 211 or 100% participants responded to the question. There were 6 or 3% that strongly disagreed; 11 or 5% that disagreed; 38 or 18% that were undecided; 106 or 50% that agreed; and 50 or 24% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.87; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.93; Standard Error = 0.06; Confidence Interval @ 95% = 3.74-3.99. The raters' perceptions of Research Questions 4, 39, and 45 were also as follows: A total of 211 or 100% participants responded to the question. There were 3 or 1% that strongly disagreed; 18 or 9% that disagreed; 29 or 14% that were undecided; 115 or 55% that agreed; and 46 or 22% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.87; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.9; Standard Error = 0.06; Confidence Interval @ 95% = 3.75-3.99. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 50 positive and 161 negative plus 46 positive and 165 negative responses. When the codes were averaged they were equal to 48 positive and 163 negative responses. The Chi Square Test and *t* Tests for research questions 4, 39, and 45 had a p-value equal to 0.000, which is less than 0.05, therefore the questions were rejected. It can be concluded that statistically that there was a significant relationship between trust and collaboration and the level of success of virtual teams.

Research Question 5, 40, and 46: Is there a significant positive relationship between trust and productivity and success in virtual teams? (Refer to survey questions 5, 40 and 46). This question was evaluated by comparing responses to questions 5, 40, and 46 using a Likert scale of 1 to 5; there a significant positive relationship between trust

and productivity and success in virtual teams. The raters' perceptions of Research Questions 5, 40, and 46 were as follows: A total of 211 or 100% participants responded to the question. There were 2 or 1% that strongly disagreed; 10 or 5% that disagreed; 36 or 17% that were undecided; 117 or 55% that agreed; and 46 or 22% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.92; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.81; Standard Error = 0.06; Confidence Interval @ 95% = 3.81-4.03. The raters' perceptions of Research Questions 5, 40, and 46 were also as follows: A total of 211 or 100% participants responded to the question. There were 7 or 3% that strongly disagreed; 7 or 3% that disagreed; 37 or 18% that were undecided; 120 or 57% that agreed; and 40 or 17% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.85; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.88; Standard Error = 0.06; Confidence Interval @ 95% = 3.73-3.97. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are "positive" (coded as 1) and less than *strongly agree* are "negative" (coded as 2). The transformation into coding resulted in 46 positive and 165 negative plus 40 positive and 171 negative responses. When the codes were averaged they were equal to 43 positive and 168 negative responses. The Chi Square Test and *t* Tests for research questions 5, 40, and 46 had a p-value equal to 0.000 which is less than 0.05, the questions were rejected. As a result, it can be concluded that statistically there a significant positive relationship between trust and productivity and success in virtual teams.

Research Question 6, 41, and 47: Is there a significant positive relationship between collaboration and productivity and success in virtual teams? (Refer to survey questions 6, 41, and 47). This question was evaluated by comparing responses to question 6, 41, and 47 using a Likert scale of 1 to 5; there a significant positive relationship between collaboration and productivity and success in virtual teams. The raters' perceptions of Research Questions 6, 41, and 47 were as follows: A total of 211 or 100% participants responded to the question. There were 2 or 1% that strongly disagreed; 12 or 6% that disagreed; 34 or 16% that were undecided; 114 or 54% that agreed; and 49 or 23% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.93; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.84; Standard Error = 0.06; Confidence Interval @ 95% = 3.82-4.04. The raters' perceptions of Research Questions 6, 41, and 47 were as follows: A total of 211 or 100% participants responded to the question. There were 3 or 1% that strongly disagreed; 12 or 6% that disagreed; 37 or 18% that were undecided; 115 or 55% that agreed; and 44 or 21% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 3.88; Median = 4; Mode = 4; Range = 4; Standard Deviation = 0.85; Standard Error = 0.06; Confidence Interval @ 95% = 3.76-3.99. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are "positive" (coded as 1) and less than *strongly agree* are "negative" (coded as 2). The transformation into coding resulted in 49 positive and 162 negative plus 44 positive and 167 negative

responses. When the codes were averaged they were equal to 48.5 positive and 162.5 negative responses. The Chi Square Test and *t* Tests for research question 6, 41, and 47 had a p-value equal to 0.000, which is less than 0.05, the questions were rejected. It can be concluded that statistically there is a significant positive relationship between collaboration and productivity and success in virtual teams.

The survey also included questions that were collected as a comparison to prior studies and for a basis for further research. Participants were asked in questions 5 and 6 to think of the ideal virtual team, disregarding their present team, if they were on one. Additionally, they were asked in choosing an ideal virtual team, how important would it be to... (Participants selected only one answer in each line across).

The ordinal data from the research survey's Likert scales have been reduced to the nominal level by combining all the *of utmost importance* and less than *of utmost importance* responses into two possible categories of "positive" (Coded 1) and "negative" (Coded 2). The nonparametric Chi Square test was performed after this conversion.

Question 5: Have a good working relationship with your teammates. This question was evaluated by comparing responses to question 5 using a Likert scale of 1 to 5; have a good working relationship with your teammates. The raters' perceptions of Research Questions 5 were as follows: A total of 211 or 100% participants responded to the question. There were 54 or 26% that responded of the utmost importance; 109 or 52% that said it was very important; 35 or 17% rated it was of moderate importance; 7 or 3% said that it was of little importance; and 6 or 3% said that it was of very little importance.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.06; Median = 2; Mode = 2; Range = 4; Standard

Deviation = 0.9; Standard Error = 0.06; Confidence Interval @ 95% = 1.94-2.18. Since *of utmost importance* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *utmost importance* as “positive” (coded as 1) and less than *utmost importance* as “negative” (coded as 2). The transformation into coding resulted in 54 positive and 157 negative responses. The Chi Square Test and *t* Tests for research question 5 had a p-value equal to 0.000, which is less than 0.05, the question was rejected. It can be concluded statistically that in choosing an ideal virtual team it is important to have a good working relationship with teammates on a virtual team.

Question 6: Work well with people who cooperate well with one another. This question was evaluated by comparing responses to question 5 using a Likert scale of 1 to 5; work well with people who cooperate well with one another. The raters’ perceptions of Research Questions 6 were as follows: A total of 211 or 100% participants responded to the question. There were 62 or 29% that responded of the utmost importance; 102 or 48% that said it was very important; 34 or 16% rated it was of moderate importance; 6 or 3% said that it was of little importance; and 7 or 3% said that it was of very little importance.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.02; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.93; Standard Error = 0.06; Confidence Interval @ 95% = 1.90-2.15. Since *of utmost importance* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *utmost importance* as “positive” (coded as 1) and less than *utmost importance* as “negative” (coded as 2). The transformation into coding resulted in 62 positive and 149 negative

responses. The Chi Square Test and t Tests for research question 6 had a p-value equal to 0.000 which is less than 0.05, the question was rejected. As a result, it can be concluded statistically that in choosing an ideal virtual team it is important to work well with people who cooperate effectively with one another.

Participants were asked in questions 7 thru 14 in their virtual team, how important is each of the following to them... (Participants selected only one answer in each line across).

Question 7: Trust in team members. This question was evaluated by comparing responses to question 5 using a Likert scale of 1 to 5; trust in team members. The raters' perceptions of Research Questions 7 were as follows: A total of 211 or 100% participants responded to the question. There were 83 or 39% that responded of the utmost importance; 82 or 39% that said it was very important; 30 or 14% rated it was of moderate importance; 9 or 4% said that it was of little importance; and 7 or 3% said that it was of very little importance.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 1.93; Median = 2; Mode = 1; Range = 4; Standard Deviation = 1.0; Standard Error = 0.07; Confidence Interval @ 95% = 1.80-2.07. Since of *utmost importance* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *utmost importance* as "positive" (coded as 1) and less than *utmost importance* as "negative" (coded as 2). The transformation into coding resulted in 83 positive and 128 negative responses. The Chi Square Test and t Tests for research question 7 had a p-value equal to

0.000, which is less than 0.05, the question was rejected. It can be concluded statistically that in a virtual team it is important to trust in team members.

Question 8: Communication technologies. This question was evaluated by comparing responses to question 5 using a Likert scale of 1 to 5; communication technologies. The raters' perceptions of Research Questions 8 were as follows: A total of 211 or 100% participants responded to the question. There were 60 or 28% that responded of the utmost importance; 92 or 44% that said it was very important; 44 or 21% rated it was of moderate importance; 11 or 5% said that it was of little importance; and 4 or 2% said that it was of very little importance.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.09; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.93; Standard Error = 0.06; Confidence Interval @ 95% = 1.96-2.21. Since *of utmost importance* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *utmost importance* as "positive" (coded as 1) and less than *utmost importance* as "negative" (coded as 2). The transformation into coding resulted in 60 positive and 151 negative responses. The Chi Square Test and *t* Tests for research question 8 had a p-value equal to 0.000 which is less than 0.05, the question was rejected. As a result, it can be concluded statistically that in a virtual team communication technologies are important.

Question 9: Effective communication between teammates. This question was evaluated by comparing responses to question 5 using a Likert scale of 1 to 5; effective communication between teammates. The raters' perceptions of Research Questions 9 were as follows: A total of 211 or 100% participants responded to the question. There

were 74 or 35% that responded of the utmost importance; 101 or 48% that said it was very important; 25 or 12% rated it was of moderate importance; 5 or 2% said that it was of little importance; and 6 or 3% said that it was of very little importance.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 1.9; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.9; Standard Error = 0.06; Confidence Interval @ 95% = 1.78-2.02. Since *of utmost importance* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *utmost importance* as “positive” (coded as 1) and less than *utmost importance* as “negative” (coded as 2). The transformation into coding resulted in 74 positive and 137 negative responses. The Chi Square Test and *t* Tests for research question 9 had a p-value equal to 0.000, which is less than 0.05, the question was rejected. It can be concluded statistically that in a virtual team, effective communication between teammates is important.

Question 10: Team collaboration. This question was evaluated by comparing responses to question 5 using a Likert scale of 1 to 5; team collaboration. The raters’ perceptions of Research Questions 10 were as follows: A total of 211 or 100% participants responded to the question. There were 66 or 31% that responded of the utmost importance; 93 or 44% that said it was very important; 39 or 18% rated it was of moderate importance; 8 or 4% said that it was of little importance; and 5 or 2% said that it was of very little importance.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.02; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.93; Standard Error = 0.06; Confidence Interval @ 95% = 1.89-2.14. Since

of utmost importance are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *utmost importance* as “positive” (coded as 1) and less than *utmost importance* as “negative” (coded as 2). The transformation into coding resulted in 66 positive and 145 negative responses. The Chi Square Test and *t* Tests for research question 10 had a p-value equal to 0.000 which is less than 0.05, the question was rejected. As a result, it can be concluded statistically that in a virtual team, collaboration is important.

Question 11: Ability to work with diversity. This question was evaluated by comparing responses to question 5 using a Likert scale of 1 to 5; ability to work with diversity. The raters’ perceptions of Research Questions 11 were as follows: A total of 211 or 100% participants responded to the question. There were 57 or 27% that responded of the utmost importance; 81 or 38% that said it was very important; 49 or 23% rated it was of moderate importance; 14 or 7% said that it was of little importance; and 10 or 5% said that it was of very little importance.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.24; Median = 2; Mode = 2; Range = 4; Standard Deviation = 1.07; Standard Error = 0.07; Confidence Interval @ 95% = 2.09-2.38. Since *of utmost importance* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *utmost importance* as “positive” (coded as 1) and less than *utmost importance* as “negative” (coded as 2). The transformation into coding resulted in 57 positive and 154 negative responses. The Chi Square Test and *t* Tests for research question 11 had a p-value equal

to 0.000, which is less than 0.05, the question was rejected. It can be concluded statistically that in a virtual team, the ability to work with diversity is important.

Question 12: Team productivity. This question was evaluated by comparing responses to question 5 using a Likert scale of 1 to 5; team productivity. The raters' perceptions of Research Questions 12 were as follows: A total of 211 or 100% participants responded to the question. There were 80 or 38% that responded of the utmost importance; 91 or 43% that said it was very important; 28 or 13% rated it was of moderate importance; 6 or 3% said that it was of little importance; and 6 or 3% said that it was of very little importance.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 1.9; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.94; Standard Error = 0.06; Confidence Interval @ 95% = 1.77-2.02. Since *of utmost importance* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *utmost importance* as "positive" (coded as 1) and less than *utmost importance* as "negative" (coded as 2). The transformation into coding resulted in 80 positive and 131 negative responses. The Chi Square Test and *t* Tests for research question 12 had a p-value equal to 0.000 which is less than 0.05, the question was rejected. As a result, it can be concluded statistically that in a virtual team, team productivity is important.

Question 13: Team success. This question was evaluated by comparing responses to question 5 using a Likert scale of 1 to 5; team success. The raters' perceptions of Research Questions 13 were as follows: A total of 211 or 100% participants responded to the question. There were 80 or 38% that responded of the utmost importance; 88 or 42%

that said it was very important; 28 or 13% rated it was of moderate importance; 9 or 4% said that it was of little importance; and 6 or 3% said that it was of very little importance.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 1.92; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.97; Standard Error = 0.07; Confidence Interval @ 95% = 1.79-2.05. Since *of utmost importance* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *utmost importance* as “positive” (coded as 1) and less than *utmost importance* as “negative” (coded as 2). The transformation into coding resulted in 80 positive and 131 negative responses. The Chi Square Test and *t* Tests for research question 13 had a p-value equal to 0.000, which is less than 0.05, the question was rejected. It can be concluded statistically that in a virtual team, team success is important.

Question 14: Relationship development. This question was evaluated by comparing responses to question 5 using a Likert scale of 1 to 5; relationship development. The raters’ perceptions of Research Questions 14 were as follows: A total of 211 or 100% participants responded to the question. There were 43 or 20% that responded of the utmost importance; 91 or 43% that said it was very important; 59 or 28% rated it was of moderate importance; 11 or 5% said that it was of little importance; and 7 or 3% said that it was of very little importance.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.28; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.96; Standard Error = 0.07; Confidence Interval @ 95% = 2.15-2.41. Since *of utmost importance* are the only responses that equate to a fully committed

recommendation, the responses were coded into two possible categories: *utmost importance* as “positive” (coded as 1) and less than *utmost importance* as “negative” (coded as 2). The transformation into coding resulted in 43 positive and 168 negative responses. The Chi Square Test and *t* Tests for research question 14 had a p-value equal to 0.000 which is less than 0.05, the question was rejected. As a result, it can be concluded statistically that in a virtual team, relationship development is important.

Questions 15-26 asked participants for information about the level of trust between virtual team members. They were asked to what extent they agree or disagree with each statement.

Question 15: Most people can be trusted. This question was evaluated by comparing responses to question 15 using a Likert scale of 1 to 5; most people can be trusted. The raters’ perceptions of Research Question 15 were as follows: A total of 211 or 100% participants responded to the question. There were 20 or 9% that strongly disagreed; 120 or 57% that disagreed; 49 or 23% that were undecided; 19 or 9% that agreed; and 3 or 1% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.36; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.83; Standard Error = 0.06; Confidence Interval @ 95% = 2.25-2.47. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 3 positive and 208 negative responses. The Chi Square Test and *t* Tests for research question 15 had a p-value equal to 0.000, which is less than 0.05, the

question was rejected. It can be concluded statistically that in terms of the level of trust between virtual team members, most people cannot be trusted.

Question 16: The members of my team are trustworthy. This question was evaluated by comparing responses to question 16 using a Likert scale of 1 to 5; the members of my team are trustworthy. The raters' perceptions of Research Question 16 were as follows: A total of 211 or 100% participants responded to the question. There were 59 or 28% that strongly disagreed; 121 or 57% that disagreed; 20 or 9% that were undecided; 8 or 4% that agreed; and 3 or 1% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 1.93; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.81; Standard Error = 0.06; Confidence Interval @ 95% = 1.82-2.04. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are "positive" (coded as 1) and less than *strongly agree* are "negative" (coded as 2). The transformation into coding resulted in 3 positive and 208 negative responses. The Chi Square Test and *t* Tests for research question 16 had a p-value equal to 0.000 which is less than 0.05, the question was rejected. As a result, it can be concluded statistically that in terms of the level of trust between virtual team members, the members of rater's teams are not trustworthy.

Question 17: I believe that remote team members tell the truth about the limits of their knowledge. This question was evaluated by comparing responses to question 17 using a Likert scale of 1 to 5; I believe that remote team members tell the truth about the limits of their knowledge. The raters' perceptions of Research Question 17 were as

follows: A total of 211 or 100% participants responded to the question. There were 36 or 17% that strongly disagreed; 121 or 57% that disagreed; 40 or 19% that were undecided; 12 or 6% that agreed; and 2 or 1% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.16; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.81; Standard Error = 0.06; Confidence Interval @ 95% = 2.05-2.27. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 2 positive and 209 negative responses. The Chi Square Test and *t* Tests for research question 17 had a p-value equal to 0.000, which is less than 0.05, the question was rejected. It can be concluded statistically that in terms of the level of trust between virtual team members, respondents do not believe that their remote team members tell the truth about the limits of their knowledge.

Question 18: I believe that remote team members can be counted on to do what they say they will do. This question was evaluated by comparing responses to question 18 using a Likert scale of 1 to 5; I believe that remote team members can be counted on to do what they say they will do. The raters’ perceptions of Research Question 18 were as follows: A total of 211 or 100% participants responded to the question. There were 41 or 19% that strongly disagreed; 120 or 57% that disagreed; 34 or 16% that were undecided; 14 or 7% that agreed; and 2 or 1% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.13; Median = 2; Mode = 2; Range = 4; Standard

Deviation = 0.83; Standard Error = 0.06; Confidence Interval @ 95% = 2.02-2.24. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 2 positive and 209 negative responses. The Chi Square Test and *t* Tests for research question 18 had a p-value equal to 0.000 which is less than 0.05, the question was rejected. As a result, it can be concluded statistically that in terms of the level of trust between virtual team members, raters do not believe that their remote team members can be counted on to do what they say they will do.

Question 19: I believe that remote team members are honest in describing their experience and abilities. This question was evaluated by comparing responses to question 19 using a Likert scale of 1 to 5; I believe that remote team members are honest in describing their experience and abilities. The raters’ perceptions of Research Question 19 were as follows: A total of 211 or 100% participants responded to the question. There were 38 or 18% that strongly disagreed; 118 or 56% that disagreed; 41 or 19% that were undecided; 10 or 5% that agreed; and 4 or 2% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.17; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.84; Standard Error = 0.06; Confidence Interval @ 95% = 2.05-2.28. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 4 positive and 207 negative responses. The Chi Square Test and *t*

Tests for research question 19 had a p-value equal to 0.000, which is less than 0.05, the question was rejected. It can be concluded statistically that in terms of the level of trust between virtual team members, participants do not believe that their remote team members are honest in describing their experience and abilities.

Question 20: I believe that remote team members have high skills and ability.

This question was evaluated by comparing responses to question 20 using a Likert scale of 1 to 5; I believe that remote team members have high skills and ability. The raters' perceptions of Research Question 20 were as follows: A total of 211 or 100% participants responded to the question. There were 47 or 22% that strongly disagreed; 112 or 53% that disagreed; 43 or 20% that were undecided; 6 or 3% that agreed; and 3 or 1% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.08; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.82; Standard Error = 0.06; Confidence Interval @ 95% = 1.97-2.19. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 3 positive and 208 negative responses. The Chi Square Test and *t* Tests for research question 20 had a p-value equal to 0.000 which is less than 0.05, the question was rejected. As a result, it can be concluded statistically that in terms of the level of trust between virtual team members, raters do not believe that their remote team members have high skills and ability.

Question 21: My remote team members all do their share of the work because in a group project, members divide and share the work among each other. This question was evaluated by comparing responses to question 21 using a Likert scale of 1 to 5; my remote team members all do their share of the work because in a group project, members divide and share the work among each other. The raters' perceptions of Research Question 21 were as follows: A total of 211 or 100% participants responded to the question. There were 43 or 20% that strongly disagreed; 131 or 62% that disagreed; 28 or 13% that were undecided; 7 or 3% that agreed; and 2 or 1% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.02; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.75; Standard Error = 0.05; Confidence Interval @ 95% = 1.92-2.12. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are "positive" (coded as 1) and less than *strongly agree* are "negative" (coded as 2). The transformation into coding resulted in 2 positive and 209 negative responses. The Chi Square Test and *t* Tests for research question 21 had a p-value equal to 0.000, which is less than 0.05, the question was rejected. It can be concluded statistically that in terms of the level of trust between virtual team members, respondent's remote team members all do not do their share of the work because in a group project, members divide and share the work among each other.

Question 22: My remote team members submit deliverables on time because it is known that a delay in completion will have a negative effect on their evaluation. This question was evaluated by comparing responses to question 22 using a Likert scale of 1

to 5; my remote team members submit deliverables on time because it is known that a delay in completion will have a negative effect on their evaluation. The raters' perceptions of Research Question 22 were as follows: A total of 211 or 100% participants responded to the question. There were 47 or 22% that strongly disagreed; 122 or 58% that disagreed; 30 or 14% that were undecided; 9 or 4% that agreed; and 3 or 1% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.05; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.82; Standard Error = 0.06; Confidence Interval @ 95% = 1.94-2.16. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are "positive" (coded as 1) and less than *strongly agree* are "negative" (coded as 2). The transformation into coding resulted in 3 positive and 208 negative responses. The Chi Square Test and *t* Tests for research question 22 had a p-value equal to 0.000 which is less than 0.05, the question was rejected. As a result, it can be concluded statistically that in terms of the level of trust between virtual team members, participant's remote team members do not submit deliverables on time because it is known that a delay in completion will have a negative effect on their evaluation.

Question 23: My remote team members all do their best because their instructors expect truth about limits of knowledge. This question was evaluated by comparing responses to question 23 using a Likert scale of 1 to 5; my remote team members all do their best because their instructors expect truth about limits of knowledge. The raters' perceptions of Research Question 23 were as follows: A total of 211 or 100% participants

responded to the question. There were 40 or 19% that strongly disagreed; 111 or 53% that disagreed; 49 or 23% that were undecided; 8 or 4% that agreed; and 3 or 1% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.16; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.82; Standard Error = 0.06; Confidence Interval @ 95% = 2.05-2.27. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 3 positive and 208 negative responses. The Chi Square Test and *t* Tests for research question 24 had a p-value equal to 0.000, which is less than 0.05, the question was rejected. It can be concluded statistically that in terms of the level of trust between virtual team members, rater’s remote team members all do not do their best because their instructors expect truth about limits of knowledge.

Question 24: I can depend on my remote team members because they are my co-business professionals and co-business professionals in a virtual team environment are always dependable. This question was evaluated by comparing responses to question 24 using a Likert scale of 1 to 5; I can depend on my remote team members because they are my co-business professionals and co-business professionals in a virtual team environment are always dependable. The raters’ perceptions of Research Question 24 were as follows: A total of 211 or 100% participants responded to the question. There were 46 or 22% that strongly disagreed; 111 or 53% that disagreed; 37 or 18% that were undecided; 11 or 5% that agreed; and 6 or 3% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.15; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.92; Standard Error = 0.06; Confidence Interval @ 95% = 2.02-2.27. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 6 positive and 205 negative responses. The Chi Square Test and *t* Tests for research question 24 had a p-value equal to 0.000 which is less than 0.05, the question was rejected. As a result, it can be concluded statistically that in terms of the level of trust between virtual team members, respondents cannot depend on their remote team members because they are their co-business professionals and being co-business professionals in a virtual team environment they are always dependable.

Question 25: I can depend on my remote team members because they will do their best to uphold the reputation of our organization. This question was evaluated by comparing responses to question 25 using a Likert scale of 1 to 5; I can depend on my remote team members because they will do their best to uphold the reputation of our organization. The raters’ perceptions of Research Question 25 were as follows: A total of 211 or 100% participants responded to the question. There were 44 or 21% that strongly disagreed; 120 or 57% that disagreed; 36 or 17% that were undecided; 9 or 4% that agreed; and 2 or 1% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 2.08; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.8; Standard Error = 0.05; Confidence Interval @ 95% = 1.97-2.18. Since

strongly agree are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 2 positive and 209 negative responses. The Chi Square Test and *t* Tests for research question 25 had a p-value equal to 0.000, which is less than 0.05, the question was rejected. It can be concluded statistically that in terms of the level of trust between virtual team members, participants cannot depend on their remote team members because they will do their best to uphold the reputation of their organization.

Question 26: Virtual teams that trust and collaborate with one another have higher productivity and more success. This question was evaluated by comparing responses to question 26 using a Likert scale of 1 to 5; virtual teams that trust and collaborate with one another have higher productivity and more success. The raters’ perceptions of Research Question 26 were as follows: A total of 211 or 100% participants responded to the question. There were 76 or 36% that strongly disagreed; 106 or 50% that disagreed; 23 or 11% that were undecided; 4 or 2% that agreed; and 2 or 1% that strongly agreed.

The descriptive Statistics and the central tendency of the distribution are presented as follows: Mean = 1.82; Median = 2; Mode = 2; Range = 4; Standard Deviation = 0.77; Standard Error = 0.05; Confidence Interval @ 95% = 1.71-1.92. Since *strongly agree* are the only responses that equate to a fully committed recommendation, the responses were coded into two possible categories: *strongly agree* are “positive” (coded as 1) and less than *strongly agree* are “negative” (coded as 2). The transformation into coding resulted in 2 positive and 209 negative responses. The Chi Square Test and *t* Tests for research question 26 had a p-value equal to 0.000 which is less than 0.05, the

question was rejected. As a result, it can be concluded statistically that in terms of the level of trust between virtual team members, virtual teams that trust and collaborate with one another do not have higher productivity and more success.

Conclusions from Additional Research

The survey also included questions that were collected as a comparison to prior studies and to serve as a basis for further research. The statistical data from these investigative questions illuminated the perceived importance of having a good working relationship with teammates. Respondents also reported that it is perceived as being important to work well with people who cooperate effectively with one another, and to trust in team members. In addition, these questions responses highlighted that communication technologies, effective communication between teammates, collaboration, the ability to work with diversity are all also important. The questions also pointed out that team productivity, team success, and relationship development are all perceived as being very important.

The answers to several of the questions responses were contrary to the reported data from the hypotheses in the survey. The responses to the hypotheses highlighted that the participants had a perception of what ideally trust and collaboration and the factor's perceived impact on productivity and success in virtual teams should be. Although the majority of the study's participants agreed that trust and collaboration were perceived as being important to virtual team productivity and success, in reality the raters painted a different picture of what was actually perceived as taking place in their virtual teams. The data's mixed conclusions that were significant are listed as follows: according to their perceptions, raters reported that most people on their virtual teams could not be trusted,

raters' statistically scored their teams as not being trustworthy, they do not believe that their remote team members tell the truth about the limits of their knowledge, and they do not believe that their remote team members can be counted on to do what they say they will do. Participants rated that they did not believe that their remote team members were honest in describing their experience and abilities, and the data showed that respondents did not believe that their remote team members had high skills and ability.

Also according to their perceptions, the respondents reported statistically that their remote team members do not all do their share of the work because in a group project, members divide and share the work among each other. The data pointed out that participant's remote team members do not submit deliverables on time because it is known that a delay in completion will have a negative effect on their evaluation. Through their perceptions it was reported that it was that raters' remote team members do not all do their best because their instructors expect truth about limits of knowledge. In addition, respondents scored that they could not depend on their remote team members because they are their co-business professionals and being co-business professionals in a virtual team environment they are always dependable. Participants also perceived that they could not depend on their remote team members because they will do their best to uphold the reputation of their organization. Moreover, the statistics from the additional questions illuminated that virtual team members that trust and collaborate with one another did not have higher perceived productivity and more success.