TESTING A PROCESS MODEL FOR STUDENT PROJECT TEAMS IN HIGHER EDUCATION WITH THE RELATIONSHIPS AMONG SHARED LEADERSHIP, PSYCHOLOGICAL SAFETY, TEAM PROCESSES, TEAM PERFORMANCE, AND CREATIVITY

A Dissertation

by

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ABSTRACT

The use of face-to-face and virtual teams has become a popular method of instruction in higher education. The popularity of working in teams has increased because effective teams are associated with positive learning outcomes. However, as students have different values and backgrounds, communication issues or conflict among team members may occur. Therefore, team researchers have placed a growing emphasis on positive team contexts (psychologically safety and shared leadership) that enable team processes, team performance, and creativity.

To enhance the team processes and performance in both virtual and face-to-face student project teams in higher education, it is necessary to examine the critical factors that led to better outcomes. Therefore, the purpose of this study is to test a holistic team process model in student project teams in higher education. First, the team process factors were examined in face-to-face team samples using exploratory factor analysis. Second, the team process measurement was verified with virtual team samples using confirmatory factor analysis. Then, the relationships among team process enablers, team processes, and team performance and creativity were examined using structural question modeling. It was concluded that the role of shared leadership positively influenced students' teamwork processes, such as goal commitment, shared identity, and trust, which improved their performance and creativity. This team process model will provide a guide for further exploration of possible intervening variables that may increase team performance when shared leadership plays a role.

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TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

LIST OF TABLES

Page

CHAPTER I

INTRODUCTION

Virtual Human Resource Development (VHRD) has been identified as an important consideration for Human Resource Development (HRD) as people work and learn via webbed or networked environments (Bennett, 2009; Bennett & Bierema, 2010; Githens, Dirani, Gitonga, & Teng, 2008). An increasing globalization and availability of information technology enable today's organizations to rely on virtual environments to work and learn (Algesheimer, Dholakia, & Gurău, 2011).

This phenomenon is not an exception in higher education settings. The popularity of online classes is increasing in the "eLearning" era. According to Palloff and Pratt (2007), the growth of internet use in higher education is directly related to the greater demand for online classes. For example, institutions of higher education like the National University (the second largest nonprofit private institute in California) are offering 60% of their courses online with most of the traditional classes having online components (Silverstone & Keeler, 2013).

In many online courses, the use of teams has become a popular method of instruction in higher education (Han, Liau-Hing, & Beyerlein, 2016). The use of working in teams in higher education has increased in a dramatic fashion because effective teams are associated with positive outcomes (Beyerlein & Han, 2016). For the past two decades, team researchers have shown a growing emphasis on leadership and climate within teamwork, team processes, and team performance (Boies, Lvina, &

Martens, 2010; Hoch, Pearce, & Welzel, 2010; Hoegl & Gemuenden, 2001; Symons & Stenzel, 2007).

Though it greatly emphasizes the advantages of teamwork in many educational institutions, working in a team can still be challenging because members have different goals, cultural values, and characteristics. The more heterogeneous the team members, such as differing academic disciplines or cultures, the more difficult it is for the team as a whole to achieve interdependence (Pelled, 1996; Suwannarat & Mumi, 2012). According to the Faultline Theory (Lau & Murnighan, 1998; Li & Hambrick, 2005), the Similarity-Attraction Paradigm (Tziner, 1985; Van Knippenberg & Schippers, 2007) and the Social Attraction Theory (Mannix & Neale, 2005), people tend to resist working with those who are different from themselves. Thus, homogeneous teams facilitate better team processes and performance due to similarity in values, beliefs, and attitudes. Researchers have also indicated that domestic students can feel reluctant to interact with international students due to cultural differences, language barriers, biases, and pressures for academic performance (Kimmel & Volet, 2012).

To overcome the aforementioned challenges, it is necessary to facilitate team learning and interactions by 1) providing psychologically safe environments and 2) developing shared leadership among team members. First, a climate of psychological safety allows team members to share information, ideas, support, and responsibility (e.g., Burke, Stagl, Klein, Goodwin, Salas, & Halpin, 2006; Edmondson, 2002, 2013). This sense of safety allows members to take the risk of being vulnerable and to be

more open to other members' contributions, which enable team creativity and innovation (Carmeli, Reiter-Palmon, & Ziv, 2010; Hunter, Bedell, & Mumford, 2007).

Second, the development of team members' leadership competencies in both face-to-face and online classes is necessary to enable team effectiveness (Cohen & Bailey, 1997). Among many different leadership styles, shared leadership is one of the most prevalent goals across most programs and universities (Symons & Stenzel, 2007; Zaccaro, Rittman, & Marks, 2001). When team members offer their leadership to others, they can experience higher commitment, share more information, which results in effective team processes and performance (Day, Gronn, & Salas, 2004; Marks, Mathieu, & Zaccaro, 2001).

Through team learning in a safe climate and shared leadership, effective team processes and performance can be achieved among the members. Effective team learning requires mutual conversation and collective thinking skills to reliably develop group intelligence and ability greater than the sum of individual members' talents. It is important to understand the team process enablers, such as a safe climate and shared leadership, so that students can (1) become competent when they graduate, (2) have the knowledge, skills, experiences, and abilities to design, implement, or lead project teams in the workplaces where they will spend their careers, and (3) expand understanding of differences between members and learn how to manage conflict and communicate when they work with a variety of people.

Problem Statement

This study adds value to team research and practices in several ways. To lead successful teams, a psychologically safe environment and opportunities for shared leadership should be created in the early phases to enable team processes and performance. Creating a psychologically safe environment helps team members to be empowered and learn from each another (Edmondson, 2002). However, only a few researchers have examined the role of the climate of psychological safety in virtual team learning. The emerging trend of working together is likely to continue, so serious research attention to an effective team learning environment is needed in higher education and other fields. Therefore, this study aims to explore the effect of psychological safety on team processes and outcomes in both face-to-face and virtual team settings.

Furthermore, little conceptual or empirical research directly addresses the association between shared leadership and team processes/outcomes in a higher education setting. In team-based projects in higher education, shared team leadership can facilitate team processes (Bolden, Petrov, & Gosling, 2009). Shared leadership has also gained appeal in the virtual work environment, but there is little evidence to show how shared leadership should be developed for virtual teams. Several shared leadership researchers have analyzed how demographic factors (i.e. age, gender, and national diversity) in virtual teams influenced shared behaviors (Grille & Kauffeld, 2015; Hoch & Kozlowski, 2014; Muethel, Gehrlein, & Hoegl, 2012) rather than examining the effects of shared leadership on team dynamics. Therefore, an aim of this study was to explore several mechanisms

contributing to the association among shared leadership, team processes, and team outcomes in both face-to-face and virtual team settings.

Pragmatically, many classes in higher education use team projects, but students hardly have an opportunity to learn how to interact or lead the projects. Many instructors find little time for teaching students the skills of effective teaming, and instructors themselves have not had much opportunity for formal team competency development. However, very few researchers have attempted to identify the strategies and interventions used to overcome these challenges in team learning contexts. This is an important area of research in order to find ways to facilitate and enhance learners' team learning skills (Rosen, Furst, & Blackburn, 2006; Warkentin, & Beranek, 1999). This study should help identify essential strategies to work and learn as a successful team in both face-to-face and virtual teams in higher education.

Purpose Statement

The purpose of this study was to test a correlational team model with relationships among team process enablers, processes, and outcomes for virtual student teams, who are taking online courses. Project team process enablers include the role of a safe learning environment and shared leadership, which influence students' teamwork processes and their outcome levels. Team processes include facilitating trust-building, shared identity, and commitment to a team goal. Team outcomes indicate team performance and team creativity. Identifying characteristics and factors contributing to team processes and outcomes is important to understand the dynamics of teamwork. This study included learning teams in classrooms in the context of higher education in the United States. The

project teams consisted of students that worked together over time to produce certain outcomes both as individuals and as teams.

Research Questions

To test the relationships among team process enablers (psychologically safe environment and shared leadership), team processes, and team performance on team assignment in undergraduate and graduate courses, the following research questions guided this inquiry:

1. What are the underlying dimensions of a team process model for face-to-face student project teams?

2. Do the dimensions of a team process model for face-to-face student project teams apply to virtual student teams?

3. What structural relationships emerge among the predetermined predictors, team process constructs, and team outcome constructs for virtual teams?

To answer the three research questions, the conceptual framework incorporates the theories of psychological safety (Edmondson, 1999; Robey, Khoo, & Powers, 2000), shared leadership (Carson, Tesluk, & Marrone, 2007) and systems theory (Hackman, 1987; McGrath, 1964; Saunders, 2000).

Conceptual Framework

In this study, the model was framed by using the perspective of the traditional input-process-outcome (IPO) model to illustrate the pattern of emergent team processes. The IPO framework has served as a major team model for decades (Salas, Stagl, & Burke, 2004), however, many scholars have modified and expanded the model

(Ilgen, Hollenbeck, Johnson, & Jundt, 2005). For this study, the team input was identified as team process enablers. The team processes were used to capture team dynamics, and the team output was used as team outcomes, such as team performance and creativity.

The following are the constructs that are covered in this study: (a) team enablers, including Psychological Safety and Shared Leadership, (b) a review of the team processes framework with the inclusion of Goal Commitment, Shared Identity, and, Trust and (c) team outcomes including Team Performance and Creativity. The conceptual framework of the proposed study is presented in Figure 1 and is based on the following theoretical assumptions for each construct.

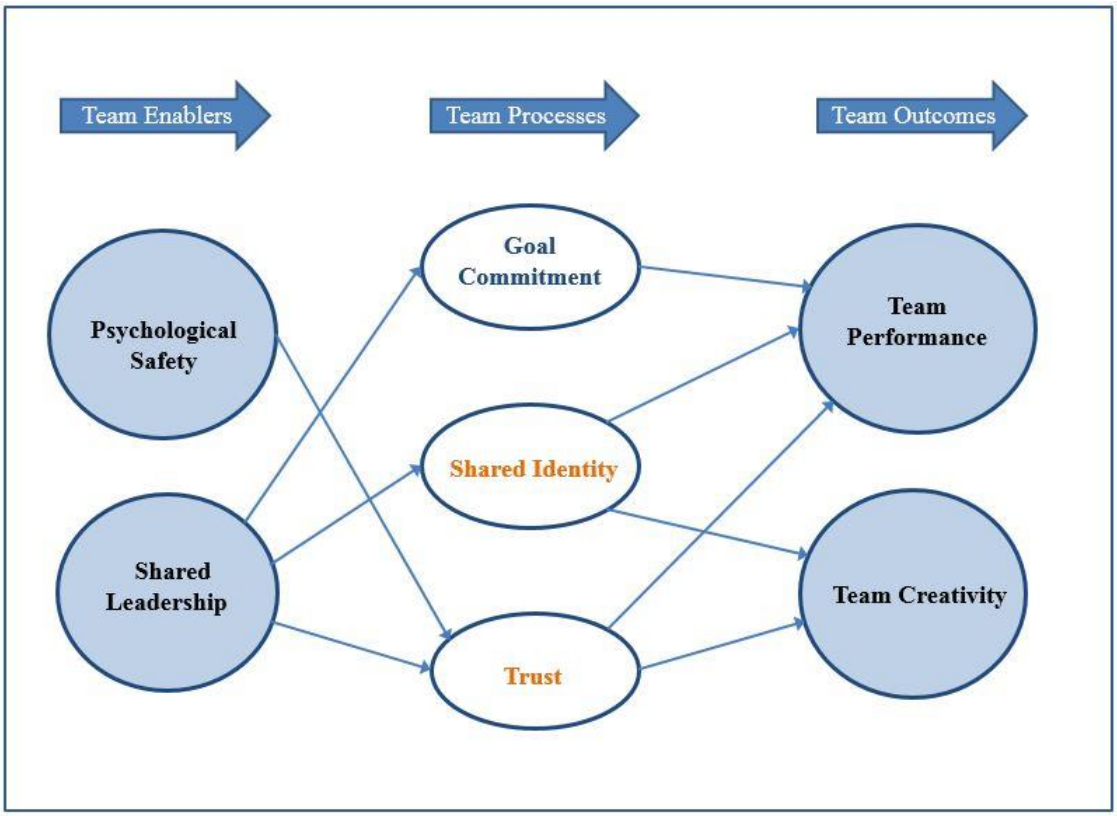

Figure 1. Conceptual framework of team process model.

Psychological Safety

Teams engaging in learning-oriented, knowledge-based work have been found to be more effective to the extent that members feel psychologically safe (Edmondson, 2003; Gibson & Gibbs, 2006). According to Schein and Bennis (1965) and Edmondson (1999), team psychological safety is defined as a shared belief that the team feels secure and capable of changing. This term is not the same as group cohesiveness nor trust but goes beyond interpersonal trust and mutual respect (Edmondson, 1999). Team psychological safety is a group-level construct, which is characterized by the team rather than individual team members.

Edmondson (1999) asserted that team learning behavior and team psychological safety are highly related, so team members learn through trial-and-error and continuous improvement. High psychological safety means that team members are willing to express their inner ideas and respect other members' viewpoints and they are prepared to undertake the responsibility of their commitment. Bradley, Postlethwaite, Klotz, Hamdani, & Brown (2012) found that teams with an established climate of psychological safety were able to exploit task conflict to improve team performance. When they exist together, psychological safety and task conflict appear to enable teams to generate more creative ideas and critically discuss decisions, without team members taking the constructive conflict personally. In a recent study, Kirkman, Cordery, Mathieu, Rosen, and Kukenberger (2013) revealed the impact of national diversity on performance and found a curvilinear (U-shaped) relationship moderated by both media richness and psychological safety. Therefore, it is important to investigate the

relationships among psychological safety and other factors that contribute to team learning and processes. While psychological safety has been noticed as a critical factor, scholars also introduced shared leadership as another factor that may be associated with team processes and performance.

Shared Leadership

As Zigurs (2003) summarized, leadership has historically been investigated from the point of view of individual personality traits, specific behaviors, different styles, types of power or influence, and with respect to situational contingencies. However, as the importance of one assigned leader has lately been questioned, leadership can also be viewed as a system. Therefore, according to this view, individuals can share and rotate leadership roles, and leadership itself becomes a collective effort distributed within the team (Zigurs, 2003).

Carson, et al. (2007) defined shared leadership as an emergent team property that results from the distribution of leadership influence across multiple team members. According to their view, leadership originates from individual team members taking responsibility for activities that influence the other team members through interaction. The resulting system can be viewed as a leadership network that shapes and influences the whole team's actions and outcomes. More recent definitions focus on leadership associated with change management, vision building, or empowerment (Yoo & Alavi, 2004).

Shared leadership is crucial for virtual teams (Lipnack & Stamps, 1997; Symons & Stenzel, 2007). Researchers of shared leadership have explored its impact

on virtual teams' outcomes (Pearce & Conger, 2002). These proponents argue that leadership development for virtual teams should focus on shared leadership because it helps the dispersed team to work as a collection of roles and behaviors that can be split, shared, and rotated, with multiple leaders existing within a team at any given time or location (Gibson & Gibbs, 2006). Kayworth and Leidner (2002) suggested that adopting shared leadership in diverse virtual teams can help minimize the challenges of managing and working in virtual teams dispersed across different time zones.

In this study, the concept of shared leadership is used differently from team processes. Team processes include goal commitment, shared identity, and trust; on the other hand, shared leadership activities are not within the scope of team processes because the concept of shared leadership considers specific leadership activities and how these can be shared among the team members (Hoegl & Gemuenden, 2001).

Shared Leadership and Team Performance

Evaluating the impact of shared leadership on team effectiveness and performance is dependent on what outcomes are valued as well as the source of the evaluation (Pearce & Sims, 2002). According to meta-analytic research, shared leadership in teams is essential to goal achievement and team effectiveness (Wang, Waldman, & Zhang, 2014). The shared leadership approach has been demonstrated to be positively associated with team effectiveness throughout various organizational settings and different types of teams (Ensley, Hmieleski, & Pearce, 2006; Hoch et al., 2010; Pearce & Sims, 2002). Pearce and Sims (2002) reported that shared leadership behaviors are positively related to team effectiveness as perceived by team managers,

members, and customers. Beyond organizational settings, shared leadership in teams of undergraduate students in higher education was positively correlated with self-reported ratings of effectiveness (Avolio, Jung, Murry, & Sivasbramaniam, 1996). In the Carson et al. (2007) study, internal team environment, consisting of shared purpose, social support, and external coaching were important predictors of shared leadership emergence, which predicted team performance. With respect to virtual teams, Pearce, Yoo, and Alavi (2004) used a sample of 28 teams and found that shared leadership was positively related to enhanced team processes.

Virtual Teams in Online Learning

As more student teams interact virtually in higher education, there has been an increase in definitions of virtual teams. Virtual teams generally consist of geographically dispersed members who work toward a shared goal by using various kinds of technologies for communication (Ale, Ahmed, & Taha, 2009). Hertel, Geiser, and Konradt (2005) noted a virtual team relies on media interaction (e.g., chat, e-mail, audio conference, and video conferencing) for members to interact with one another in place of meeting face-to-face. More scholars have expanded their definition of virtual teams with computer-based systems by including other dimensions, such as level of technology support, degree of time working apart on task, temporary, interdependence, cultural diversity, and degree of physical distance (Baba, Gluesing, Ratner, & Wagner, 2004; Hertel et al., 2005; Kirkman & Mathieu, 2005; Martins, Gilson, & Maynard, 2004). These virtual teams need to be studied more carefully in order to facilitate

learning in online courses as the number of online classes is increasing in higher education these days.

According to Allen and Seaman (2014), "in excess of 6.7 million students were taking at least one online course during the fall 2011 term, an increase of 570,000 students compared to the previous year" (p. 7). For the past eight years, online learning is growing at a faster rate than the overall enrollment in the higher education sector (Allen & Seaman, 2014). Tracking online education in the United States revealed that the number of students taking at least one online course increased by over 411,000 in 2012 to a new total of 7.1 million (Allen & Seaman, 2014). This is a significant development in the academic environment. Their survey also revealed that 32% of students are taking at least one online class, and 77% of academic leaders rated online learning outcome as equal or superior to that of the face-to-face class setting. However, these figures and survey results may not show the reality of online learning or the effect of virtual team learning. Therefore, this study helps understand the ways to increase student learning outcomes by enhancing virtual team processes in online classes.

Team Processes Framework

Across many different models, teamwork generally refers to processes that members use to accomplish interdependent work. Team process researchers have distinguished task and socio-emotional processes as keys to team effectiveness by enabling team members to combine their resources to resolve task demands (Ilgen et al., 2005; Kozlowski & Ilgen, 2006). For example, team input factors, such as

psychological safety and shared leadership, and their impacts on team processes and performances can generally be classified into task and socio-emotional processes (Marks et al., 2001; Saunders, 2000). Task processes occur among team members to accomplish a task or goal through communication. On the other hand, socio-emotional processes refer to building relationships to promote shared identity and trust.

Task processes facilitate team members to have a sense of joint effort toward a common goal (Salas & Cannon-Bowers, 2001; Valentine, Nembhard, & Edmondson, 2015; Zaccaro et al., 2001) by actions, such as communication and coordination (Valentine et al., 2015). Team members' shared commitment to their shared goals can impact the team's capacity to perform successfully (Kozlowski & Ilgen, 2006). Teams with strong beliefs about their abilities can achieve higher performance levels since they put more effort toward the task (Gully, Incalcaterra, Joshi, & Beaubien, 2002).

Socio-emotional processes refer to a team's effort to establish emotional climate by building trust, group emotions, or shared identity (Barsade & Gibson, 2012; Gully, Devine, & Whitney, 2012; Jans, Postmes, & Van 2011; Kasper-Fuehrer & Ashkanasy, 2001). Team members can build trust and establish shared identity to understand that members have in common, which contribute to the team's performance (Kozlowski & Ilgen, 2006; Mohammed & Dumville, 2001).

Team Outcomes

Team effectiveness or success are often examined regarding the relationships between input, processes, and outputs (I-P-O) of a team (Hackman, 1987; McGrath, 1964; Salas, Stagl, & Burke, 2004). The I-P-O framework has inputs, such as

leadership and team environment, which shape teamwork processes, which in turn, lead to outputs, such as team performance and team creativity. A recent theoretical framework was presented in a way that the original model of the I-P-O framework is deficient for explaining the various factors that mediate the relationship between inputs and outputs (Ilgen et al., 2005). Therefore, the framework of input-mediator-output-input (IMOI) emerged by adding the extra "I" at the end to note the cyclical causal feedback (Ilgen, et al., 2005). In this study, the I-P-O framework is used to display the simplified structural relationships, but the IMOI may apply to the real world.

In this study, both team performance and team creativity were used as a framework for team outcomes. Team performance has been assessed by scholars to examine team effectiveness in regards to a team's outcome or final product (e.g., Kanawattanachai & Yoo, 2007; Schaubroeck, Lam, & Cha, 2007). Levi (2016) defined team success and team performance as completing the task, developing social relations, and benefiting the individual team members. Likewise, scholars have defined team performance differently, however, this study uses the framework of I-P-O with the assumption that each team process can help team members to enhance team performance by creating a psychologically safe environment and practicing shared leader responsibilities (Kayworth & Leidner, 2002; Zaccaro et al., 2001).

In terms of team creativity, over the last 10-15 years, the creativity literature defined creativity as a team outcome by examining creativity as the production of new and useful ideas regarding products and services (e.g., Amabile, 1996; Zhou, 1998). According to Gilson and Shalley (2004), team creativity has been defined as collective

efforts to generate products or processes by taking a novel and useful approach. This study attempted to discover if team enablers and processes are associated with team creativity.

To sum up, depending on how team members set up the team environments, the team climate will affect team processes and outcomes differently. That is why this study has attempted to further examine several hypotheses to examine if team enablers are associated with team processes and performance of student teams.

Hypotheses Development

Based on the conceptual framework, main hypotheses were developed. The research question was to examine if team enablers are associated with team processes, which influence team performance of student teams. Each hypothesis represents substantial scholarly literature (e.g., Beyerlein, Prasad, Cordas, & Brunese, 2015; Han & Beyerlein, 2016). For a visual representation of the research model, see Figure 2. The hypotheses are as follows:

Hypothesis 1.1: Psychological safety among team members will correlate positively and significantly with team trust in virtual teams.

Hypothesis 1.2: Task-oriented shared leadership (TOSL) will correlate positively and significantly with team goal commitment in virtual teams.

Hypothesis 1.3: Relation-oriented shared leadership (ROSL) will correlate positively and significantly with shared identity in virtual teams.

Hypothesis 1.4: ROSL will correlate positively and significantly with team trust in virtual teams.

Hypothesis 2.1: Team goal commitment will correlate positively and significantly with team performance in virtual teams.

Hypothesis 2.2: Shared identity will correlate positively and significantly with team performance in virtual teams.

Hypothesis 2.3: Shared identity will correlate positively and significantly with team creativity in virtual teams.

Hypothesis 2.4: Team trust will correlate positively and significantly with team performance in virtual teams.

Hypothesis 2.5: Team trust will correlate positively and significantly with team creativity in virtual teams.

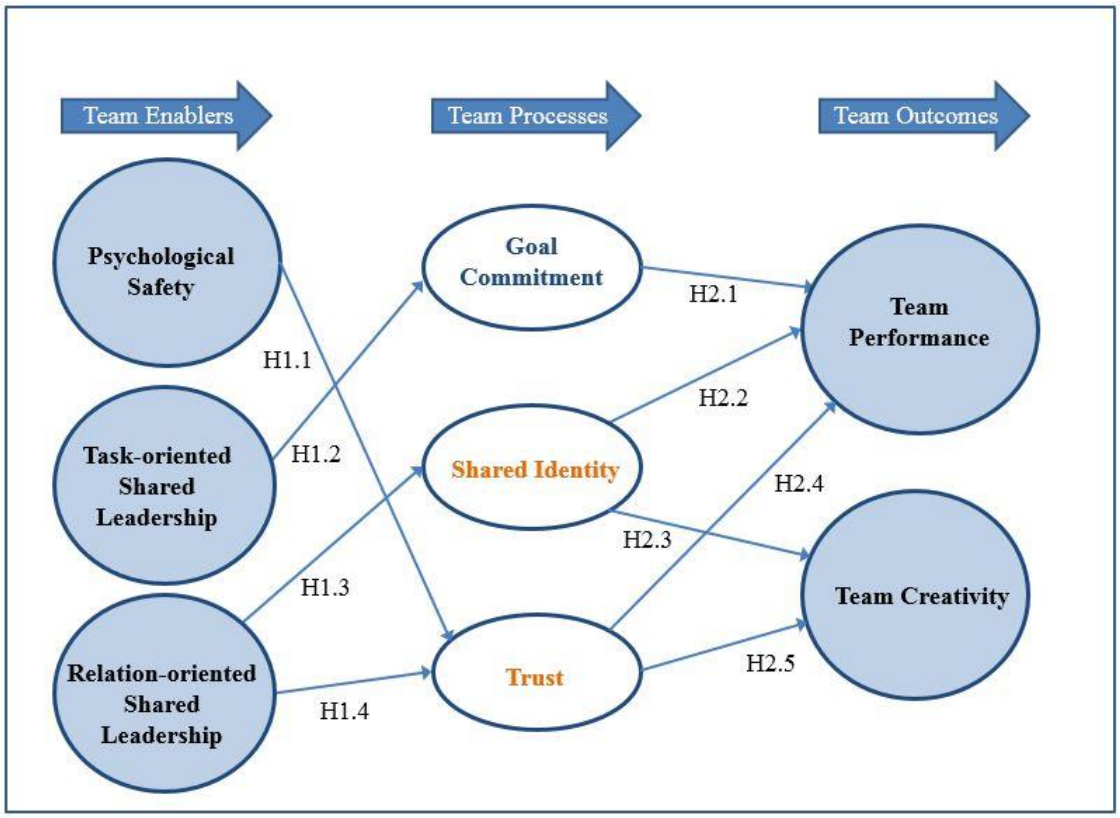

Figure 2. Hypothesized team process model.

Introduction to Methods

To examine the relationships among project team process enablers, team processes, and team outcomes, the perceptions of each concept were asked to undergraduate and graduate students in a higher education institution. Questionnaires were administered to student teams in the beginning of the semester and at the end of the semester in Spring 2016 and Fall 2016 to examine the perceptions of their teamwork experiences. The questionnaires included team self-ratings of team enablers, team processes, and its effectiveness (Pearce & Sims, 2002).

Participants

The participants of this study were students, who have taken courses in the Department of Educational Administration & Human Resource at a large Southwestern university at both the undergraduate and graduate levels. Many of the institutions of academic courses use student project teams in the form of team-based learning (Michaelsen & Sweet, 2011). Most of these teams conduct a project involving organizational clients in the profit or not-for-profit sectors. Some of the teams attend class on campus and thus have the opportunity to meet face-to-face, supplementing meetings with electronic communications. Other classes are online with students geographically dispersed, thus they meet virtually, relying on electronic communication devices all or most of the time. All course instructors in the Department of Educational Administration & Human Resource were invited to participate. Instructors set up the team project and facilitated the final team project.

Data Collection

To obtain a multifaceted picture of the students' knowledge of team dynamics and their use of that knowledge during the semester, a questionnaire was used to assess students' perceptions of team's psychologically safe climate, shared leadership, team processes, and team performance.

Instrumentation

The survey instruments for student teams consisted of three sections: (a) team process enablers (psychological safety and shared leadership), (b) three team process constructs, and (c) team performance and creativity. Questionnaire data was used to assess student perceptions of shared leadership (Grille & Kauffeld, 2015) and psychological safety (Edmondson, 1999). Edmondson's (1999) psychological safety scale was used to assess their beliefs that their teams had created a secure environment for expressing their opinions.

These scales were adopted to assess team processes broadly into two categories. The two team process constructs consist of socio-emotional processes and task-related processes. The socio-emotional construct is comprised of items pertained to teamwork elements, such as shared identity (Mortensen & Hinds, 2001) and trust (Hakonen, 2010). The task-related construct includes goal commitment (Aubé & Rousseau, 2005).

Lastly, team outcomes include the overall performance on the team project and team creativity, assessed by the team members in the class. To create a team performance measure, several instructors helped create the grading rubric to assess the quality of the team reports. The full set of instruments is listed in Appendix A and B.

Assumptions of using a survey questionnaire

1. Participants will understand the questions and are competent to answer the questions.

2. Participants that respond to the survey will reflect themselves and team members for which the survey is intended.

3. Participants are honest and forthcoming when answering the questions on the survey.

For a more detailed explanation, see *Chapter III, Methodology.*

Significance of the Study

This study adds value to both practice and research because not all assumptions and practices about traditional face-to-face teams seem relevant to teams in virtual environments. In a virtual environment, teams tend to have less social interactions that build relationships and trust. By examining team dynamics in relation to team input, process, and performance, this study can help future researchers to explore what factors help increase team processes and performance when working in virtual teams.

This study is significant because no previous research has explored the relationship between team psychological safety and shared leadership in a virtual team setting. This study's empirical results can support researchers for adopting the shared leadership under a psychologically safe environment in a virtual team setting. This study adds value to future research to find out various factors and conditions that can increase shared leadership in the virtual team. For example, some students or instructors in higher education may consider sharing leadership is not efficient because

it takes too much time, and people tend to refuse to share responsibilities because they expect a team leader to do more work than team members. These challenges similar to those above can be addressed through this research.

The role of VHRD has become vital for increasing facilitating work processes of teams (Fazarro & McWhorter, 2011). Specifically, the need to connect experts and students located worldwide necessitates studying virtual team learning and team processes. However, the current literature of developing a virtual team model based on a face-to-face team model is minimal. Also, the current state of HRD related research on the effects of individuals' deep-level (e.g., expertise and work experience) and surface-level diversity (e.g., age, gender, and ethnicity) on team processes and performance is lacking especially in an education environment.

In addition, the development of team skills has relevance for many careers in today's complex and fast-paced globalized workplace. Team learning and team dynamics have relevance for HRD for several reasons:

1. Course content in the Department of Educational Administration & Human Resource covers teams as one key to organizational effectiveness.
2. Students work in teams in most courses in the Department of Educational Administration & Human Resource. A well-functioning team environment may improve the quality of their experience and their learning, resulting in better attitudes and better assignment work.

3. After graduation, as professionals, they will be working in teams with other HR-related colleagues and colleagues from other disciplines – either as team members or as team leaders.

4. As professionals, they may be responsible for team training for employees across the organization.

HRD researchers and practitioners seek to utilize insights from research and practice to enhance learning and performance for individuals, groups, organizations and large systems (Swanson & Holton, 2005). HRD professionals seek to create a learning organization by developing teamwork skills in both face-to-face and virtual teams and improve systems to meet organizational goals.

Definition of Terms

In this section, the definitions of terms that are used in this study are discussed.

Faultlines: Faultlines refer to "hypothetical dividing lines that may split a group into subgroups based on one or more attributes" (Lau & Murnighan, 1998, p. 328).

Human Resources Development (HRD): A continuous process of learning and performance improvement for individuals, groups, organizations, and multiple stakeholders within systems through various areas of expertise, such as training and development, employee development, organizational development, and organizational learning (Swanson & Holton, 2001).

Project team: A collection of students, who are assigned some autonomy, share responsibility for project outcomes and are also interdependent (Rasmussen & Jeppesen, 2006).

Virtual Human Resource Development (VHRD): VHRD is defined as a webbed or networked environment that creates an ecology in which people work and learn (Bennett, 2009; Bennett & Bierema, 2010).

Shared leadership: Shared leadership is defined as an emergent team property that results from the distribution of leadership influence across team members (Carson et al., 2007; Day, Sin, & Chen, 2004).

Team performance: The perception that the team is very competent, gets its work done very effectively, and has performed its job well (Lam, Schaubroeck, & Brown, 2004).

Team psychological safety: Team psychological safety is defined as a "shared belief that the team is safe for interpersonal risk taking" (Edmondson, 1999, p.354).

Virtuality: Virtuality refers to the discontinuities in geography, time zone, organization, national culture, work practices, and technology (Chudoba, Wynn, Lu, & Watson-Manheim, 2005).

Virtual teams: A group of individuals who work across boundaries of time, geography, nationality, and culture using information and communications technologies, such as groupware, e-mail, an intranet, or video conferencing, and so forth, to collaborate from different locations for a defined work and for achieving defined objectives (Darisipudi & Sharma, 2008).

Virtual team processes: Virtual team processes are defined as a series of action that leads virtual teams to complete the jobs. They may include both tasks and socio-emotional activities (Liu, Burn, & Stoney, 2009).

Virtual team performance: Virtual team performance is defined as the quality and effectiveness of execution of virtual teams in performing the tasks (Liu et al., 2009).

Summary

In *Chapter I,* an introduction to the research and a brief explanation of the factors involved in the study were presented. The problem statement was then discussed. Next, the purpose of the study and the research questions and hypotheses were provided followed by the conceptual model and framework of the study. Introduction to for using a survey were presented next. Further, the significance of the study was discussed, and the definition of terms used in the study. In *Chapter II,* a review of the literature on the process factors involved in the study is presented as well as the theoretical framework of the study.

CHAPTER II

LITERATURE REVIEW

Due to the fact that teams are increasing as a learning format in many classes in higher education (Helle, Tynjälä, & Olkinuora, 2006), it is necessary to facilitate team learning and team interactions by providing psychologically safe environments and developing shared leadership among team members. Therefore, the relationships among team enablers (Psychological Safety and Shared Leadership), team processes, and team outcomes were the focus of the current study. The following sections are the theoretical framework underlying the current study and a review of the scholarly literature related to the current study. The relationships between and among Psychological Safety, Shared Leadership, team process factors, Team Performance, and Creativity are further examined. Lastly, implications of HRD research, theory, and practice are provided.

The Literature Review Process

A thorough review of the literature was performed in the following process: 1) search for and collect articles; 2) summarize articles relevant to the study; and 3) integrate summaries and relevant information pertaining to the study. With regard to the selection of articles for the key constructs of the study, an extensive list of relevant keywords and the following search terms were used: *psychological safety, shared leadership, virtual team, team processes, trust, goal commitment, shared identity, team creativity, and team performance.* The search for articles included both simple and advanced searches using the key constructs and/or a combination of related constructs.

Research studies and other scholarly content were found using multiple databases. Through ProQuest, four databases were utilized: PsycINFO, ERIC, Sociological Abstract, and ABI/INFORM. Through EBSCO, four additional databases were searched: Academic Search Complete, Business Source Complete, Communication and Mass Media Complete, and Communication Abstracts. The citation pearl-growing method (Schlosser, Wendt, Bhavnani, & Nail-Chiwetalu, 2006) was also conducted through the Scopus software program to search for other relevant articles or citations from the reference lists of the included articles. This pearl-growing technique helps identify appropriate quality filter and data-based guidance in selecting effective keywords, which goes beyond its previously exclusive focus on keywords. Google Scholar was utilized to look at articles that cite the included original article.

For inclusion in this review, studies had to: (a) be published in peer-reviewed journals or books, (b) be published between 1998 (when studies of virtual teams were launched) and 2016, and (c) be empirical or theoretical review studies that involve Psychological safety and shared leadership pertaining to inputs, socio-emotional processes, task processes, and team outcomes. The primary journals selected in this study included the following: *Academy of Management Journal, Academy of Management Review, Journal of Applied Psychology, Journal of Management, Journal of Organizational Behavior, Organizational Behavior and Human Decision Processes, Organizational Behavior and Human Performance, Small Group Behavior, and Small Group Research.* These journals include disciplines that pertain to the study topic, such as human relations, business and management, organizational behavior, sociology, and

psychology. The final step in the literature review process included summarizing articles, books, and other relevant literature and synthesizing key information from each of these, which involved the evaluation, interpretation, and integration of works collected.

Theoretical Framework

In this section, Human Resource Development Theories, Virtual Human Resource Development Theories, Faultline Theory, and Systems Theories are introduced as a framework for this study. These theories were chosen to elaborate face-to-face and virtual teamwork as a process and a system of learning and development of students.

Human Resource Development Theories

In this paper, most theories are based on psychological theories and systems theories. HRD theories and theorists are particularly relevant to this research because HRD is a process or system within the larger organizational and environmental system. In more detail, HRD is the process of developing and leveraging human expertise through organizational and personal development for the purpose of improving performance and facilitating learning processes (Swanson & Holton, 2001).

This study is based on the HRD theories because, according to Swanson (2001), the field of HRD is built on three major theories: (1) systems theory, (2) psychological theory, and (3) economic theory. First, the systems theory captures the complex and dynamic interactions of environments, organizations, work process, and group/individual variables operating at any point in time and over time. Second, the

psychological theory captures the core human aspects of developing human resources as well as the socio-technical interplay of humans and systems. Third, the economic theory captures the core issues of the efficient and effective utilization of resources to meet productive goals in a competitive environment. HRD integrates the components from the three theories and forms a theory unique to the field of HRD (McLean & McLean, 2001).

In this study, multiple systems theories were used to capture team process factors and the complex interactions of different variables. To understand human behavior and socio-technical processes, psychological theories, such as social psychology and organizational psychology, were used. The economic theory can be applied to improve team processes for efficiency and performance of face-to-face and virtual teams. Based on the broad lenses of HRD foundation and theories, the following sections will include the detail components, such as VHRD, virtual teams, faultline theory, and the systems theory.

Virtual Human Resource Development

HRD encounters in virtual environments are becoming more common. The reasons for using this VHRD framework is to compare the face-to-face team settings with virtual team settings. With technology transforming places from physical spaces into virtual environments (Chalofsky, 2010), the HRD function is increasingly related with formulating effective strategies for technology-based learning (Wang, 2010). Virtual Human Resource Development is defined as a webbed or networked environment that creates an ecology in which people work and learn (Bennett, 2009;

Bennett & Bierema, 2010). Leveraging technology helps increase the learning capacity and work processes of teams, which is the main role of VHRD (Fazarro & McWhorter, 2011).

Virtual Teams

As more student teams interact virtually in higher education, there has been an increase in definitions of virtual teams (VTs). Virtual teams generally consist of geographically dispersed members who work toward a shared goal by using various technologies for communication (Ale, Ahmed, & Taha, 2009). Hertel, Geiser, and Konradt (2005) noted a virtual team relies on media interaction (e.g., chat, e-mail, audio conference, and video conferencing) for members to interact with one another in place of meeting face-to-face. More scholars have expanded their definition of virtual teams with computer-based systems by including other dimensions, such as level of technology support, degree of time working apart on task, temporary work, interdependence, cultural diversity, and degree of physical distance (Baba, Gluesing, Ratner, & Wagner, 2004; Hertel et al., 2005; Kirkman & Mathieu, 2005; Martins, Gilson, & Maynard, 2004; Powell, Piccoli, & Ives, 2004).

In this study, the term project team describes the sample and the research context. In a higher education setting, project teams are a collection of students who are assigned some autonomy, share responsibility for project outcomes, and are also interdependent (Rasmussen & Jeppesen, 2006). Specifically, the project virtual teams are a group of individuals who work across boundaries of time, geography, nationality,

and culture to achieve defined objectives by using communications technologies (Darisipudi & Sharma, 2008).

Faultline Theory

The Faultline Theory is introduced as framework for this study because this theory explains the team dynamics and the reasons why positive team enablers are needed to increase team processes and outcomes. The Faultline Theory was developed by Lau and Murnighan (1998; 2005) to further explain the relationship between team members' dynamics and performance. The Faultline Theory suggests that multiple types of differences can combine to create a hypothetical line within a group and that this increases the salience of subgroups (Lau & Murnighan, 1998). Strong faultlines are beneficial to subgroup members' increased satisfaction, improved communication, and higher cohesion.

However, disadvantages of strong faultlines to the whole team is that there are more conflicts between subgroups, which decreases team performance (Li & Hambrick, 2005). These faultlines heighten intergroup comparison and bias (Brewer, 1979) because people tend to resist working with those who have different goals, cultural values, and characteristics. According to the social identity perspective (Tajfel & Turner, 1986), people categorize themselves and others into different social groups, which then serve as sources of their social identity. According to the Similarity-Attraction Paradigm (Tziner, 1985) and the Social Attraction Theory (Mannix & Neale, 2005), heterogeneous groups hinder team performance due to the group members' similarity in values, beliefs, and attitudes. Particularly, empirical studies of

international teams have found that strong nationality faultlines were related to communication barriers, conflicts, and behavior disintegration, which in turn hindered performance (Li & Hambrick, 2005). Therefore, it is important to discover how and when diversity causes social categorization, triggers inter-group bias, negatively affects team processes, gives rise to the elaboration of task-relevant information, and brings positive influences into team processes (Van Knippenberg, De Dreu, & Homan, 2004).

Thatcher and Patel (2011) examined a theoretical model using a meta-analysis to address conflicting findings in the demographic faultlines literature. Their meta-analyses of using 39 studies incorporating 24,388 individuals in 4,366 teams demonstrated that demographic diversity has significant effects on demographic faultline strength. Age diversity has the strongest relationship with faultline strength, followed by race, sex, tenure, functional background, and education diversity. For example, team members with different educational backgrounds may prefer to carry out tasks in different ways, which would cause conflict (Jehn, 1997; Jehn, Chadwick, & Thatcher, 1997). Task-oriented conflict, caused by educational specialty heterogeneity, can also lead to relationship-oriented conflict and negative interactions among members, which damages team creativity and learning (Jehn, 1997; Janssen, van de Vliert, & West, 2004). Furthermore, functional differences may cause disadvantageous social categorization, which may harm teams' interactions, such as knowledge sharing and elaborating creative ideas (Van Knippenberg et al., 2004).

Likewise, stronger demographic faultlines lead to greater relationship conflict, task conflict, and lower team cohesion. In turn, strong demographic faultlines directly

reduce team performance and team satisfaction; the negative effects of demographic faultlines on team performance were much stronger than those for team satisfaction. Therefore, to reduce the faultline and increase team learning, it is necessary to understand the team process enablers, such as team psychological safety and shared leadership, which will be discussed further in the following sections. Also, it is necessary to examine existing theories that explain teamwork dynamic.

Systems Theory to Teamwork

In this study, the effects of psychological safety and shared leadership on team processes and team outcomes were mainly discussed because these components were not investigated often in the literature. This structural relationship of the team model fits within the functional perspective of team effectiveness (Wittenbaum, Hollingshead, & Botero, 2004) or the general input–process–output (I–P–O) model because it allows for normative procedures of describing and predicting team outcomes. Among many different models, frequently cited framework for understanding team dynamics is the I-P-O model (Hackman, 1987; McGrath, 1964). This model includes the factors that individual members bring to the team (input), the interaction (process), and the product (output). A key idea of the I-P-O framework is that input variables affect outcome variables via the interaction process within a team (Hackman, 1987). According to a McGrath's analysis on team behavior and performance (1964), the inputs in this model can be further grouped into three categories: individual-level factors, group-level factors, and environmental-level factors. The main inputs for project teams are environmental characteristics (e.g. team environment, psychological safety climate),

team characteristics (e.g. composition, shared leadership), and individual factors (e.g. members' skill and experience).

Team processes refer to the interactions that take place among team members and include communication patterns, cohesion, and other forms of influence. Processes were initially defined as the interactions and interpersonal behaviors among team members (McGrath, 1964) that ''transform resources into a product" (Gladstein, 1984, p. 500). According to Marks and colleagues (2001), processes refer to ''members interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing task work to achieve collective goals" (Marks, Mathieu, & Zaccaro, 2001, p. 357).

Team output refers to team outcomes associated with productivity, as well as the capability of team members to continue working cooperatively. Team outputs can include performance, satisfaction, and attitudes of team members (Marks et al., 2001). The I–P–O model has previously been adapted for studying project teams and serves as useful framework for examining team processes (Hackman, 1987; McGrath, 1964). The I–P–O model is the dominant framework used in the study of project teams because it provides a useful basis for organizing and integrating literature on shared leadership in project teams. Thus, the theoretical foundations were organized around the I-P-O and life cycle model adapted from Saunders (2000). These system theories were considered when developing this research.

In this study, the most popular team develop model (Tuckman's team development model) was not considered. There are several reasons for not using this

model. First, there are external factors affecting group development, including individual roles, resource allocation, and pressure from external stakeholders (Bonebright, 2010). Recent theories recognize the complexity of team dynamics in today's world and are not easily represented in a simple model like Tuckman's team development model. Second, not all virtual teams follow the same stage structure. According to this model, an analysis of team activities has to be performed one stage at a time, which restricts those activities from happening simultaneously. Third, this team development model may not fit in virtual teams because of the concepts of swift trust, the degree of visibility, technology issues, task complexities, and other contextual factors. For example, the team performance model proposes seven stages of team performance: orientation, trust building, goal or role clarification, commitment, implementation, high performance, and renewal. However, not all virtual teams may follow the same seven-stage structure, or team activities may be performed simultaneously.

Team input variables can be categorized into three levels: (a) individual level, (b) group level, and (c) contextual level. However, all possible relationships among the team process predictors and outcome variables cannot be fully explained by these different variables, theories, and models. Therefore, for this study, a team and a contextual level of input variables were used by focusing on the relationships among the team input, team process factors, and team performance. Thus, the individual level input, such as KSA, personality traits, cultural values are not considered in this study.

To scrutinize the possible links among the team process factors, an extensive literature review was required, which is addressed in more detail in the following sections. In this study, psychologically safe team environment and shared leadership are the team input variables that are expected to affect the interaction process among team members. The interaction process, in turn, is viewed as affecting team outcomes, which is made up of various team performance variables. A graphical representation of the theoretical framework for the current study was delineated in Figure 1 of *Chapter I.* The following section reviews some key definitions that provide framework for this study. The terms *psychological safety, shared leadership, team processes,* and *team performance* provide boundaries for this chapter.

Team Processes

Depending on the climate of psychological safety among team members and the degree of shared leadership performed in a team, the team input variables may positively or negatively impact team processes. Therefore, it is important to examine the team process factors that are influenced by team input variables and look at dynamic relationships among them. In this section, an overview of team processes and various team process factors will be discussed.

Team Process Overview

As documented in the current literature, team input factors and their impacts on team processes and performances can generally be classified into task and socio-emotional processes (Marks et al., 2001; Saunders, 2000). Task processes occur among team members to accomplish a task or goal through communication and knowledge

sharing. On the other hand, socio-emotional processes refer to building relationships among team members to promote shared identity and trust.

Different from face-to-face team processes, virtual team processes are defined as series of actions that lead virtual teams to complete the tasks. They may include both tasks and socio-emotional activities (Liu et al., 2009). Several theories are presented to indicate the differences in virtual and face-to-face team processes. Schiller and Mandviwalla (2007) presented an in-depth analysis of current theory application and development in virtual team research. As Schiller and Mandviwalla (2007) found 25 virtual team-relevant theories, these theories demonstrate the needs to compare the virtual team process and performance with face-to-face teams. Several theories are discussed to understand why and how virtual teams are different from face-to-face teams.

First, the social presence theory suggests that the fewer channels are available within a medium, the less attention is paid by the users to the presence of other social participants' interactions (Cui, Lockee, & Meng, 2013). It was concluded that computer-mediated communication, because of its lack of sound and visual cues, can be perceived as impersonal and lacking in normative reinforcement, so there may be less socio-emotional content exchanged. It is still in question how much influence social presence would have on the performance of virtual teams. In addition, it is also not clear how to establish and maintain a social presence during the life cycle of virtual teams.

Second, the social information processing theory proposes that the rates of social information exchange differ between face-to-face and virtual teams. This theory is used to explain why this study compares team dynamics between face-to-face and virtual teams (Fulk, Steinfield, Schmitz, & Power, 1987). This theory proposes that the restrictiveness of the virtuality initially hinders relational intimacy between unfamiliar participants and that recurrent use of a technology is likely to impede relational development in groups. This theory implies that virtual teams take longer to exchange information than face-to-face teams. These restrictions tend to slow the process of developing relational intimacy. Not many researchers deeply explored the dynamic process of how information is exchanged in virtual teams.

Team Input

In the previous section, team related theories and concepts were examined. In this section, theories and concepts of psychological safety and shared leadership will be discussed as major team input variables. These two variables are a major focus of this study.

Psychological Safety

When conducting a team project, team members learn by sharing their skills, knowledge, and ideas. Team members debate their ideas constructively with the other members so as to contribute to their team's success. However, the team climate should be positive in order to learn from each other and to perform their best. Those positive team climates are creating a psychological safety environment and a shared belief so that the team is safe for sharing knowledge and ideas (Edmondson, 1999). When there

exists a strong faultline separating team members due to age, educational specialties, nationality, and gender, team members may be reluctant to speak their own ideas because of fear being embarrassed or rejected (Mumford & Gustafson, 1988), which may even create more faultlines, which can lead to conflict and less communication within the team (Lau & Murnighan, 2005). To that end, in this section, the concept of psychological safety will be discussed as preconditions of team processes.

Team Psychological Safety Defined

Teams engaging in learning-oriented, knowledge-based work have been found to be more effective to the extent that members feel psychologically safe (Edmondson, 2003). Team psychological safety is defined as a "shared belief that the team is safe for interpersonal risk taking" (Edmondson, 1999, p.354). Individuals need to have psychological safety in order to feel secure and capable of changing (Schein & Bennis, 1965; Edmondson, 1999). Kahn (1990, p.708) described psychological safety similarly as "feeling able to show and employ one's self without fear of negative consequences to self-image, status, or career." This term of team psychological safety is not the same as group cohesion nor trust but goes beyond interpersonal trust and mutual respect (Edmondson, 1999; Frazier, Fainshmidt, Klinger, Pezeshkan, & Vracheva, 2016). Team psychological safety should be a group-level construct, which is characterized by the team rather than individual team members.

Edmondson (1999) asserts that team learning behavior and team psychological safety are highly related, so team members learn through trial-and-error and continuous improvement. Psychological safety influences team learning activities because team

members tend to choose their actions on the basis of the level of risk they attach to them (Edmondson, 2003; Edmondson & Nembhard, 2009; Yagil & Luria, 2010). If team members believe that there is a chance that they might be hurt, embarrassed, criticized, or ridiculed, they may choose to refrain from acting (Choo, Linderman, & Schroeder, 2007; Edmondson, 2003; Kark & Carmeli, 2009).

The Role of Team Psychological Safety

Psychological safety can affect team processes in term of task-related and socio-emotional processes. First, having team psychological safety enables team members to refine their expertise during planned group activities and motivate them to utilize extant knowledge toward task completion (Robson, Katsikeas, & Bello, 2008). Bradley et al. (2012) also found that teams with an established climate of psychological safety were able to exploit task conflict to improve team performance. When they exist together, psychological safety and task conflict appear to enable teams to generate more creative ideas and critically discuss decisions, without team members taking the constructive conflict personally.

Second, psychological safety enhances the socio-emotional process, such as the quality of interpersonal relationships within the team (Yagil & Luria, 2010). Positive interpersonal relationships relate to willingness to support, to share experiences and expertise, and to identify opportunities for common improvement (Yagil & Luria, 2010). According to adult learning principles, creating a safe learning environment encourages learning within team members and sharing their experiences (Merriam, Caffarella, & Baumgartner, 2012). Individuals who trust and get along well with each

other set aside fears of opportunism and openly share extant information and knowledge in task accomplishment (Choo et al., 2007; Peters & Karren, 2009). Therefore, a climate of psychological safety can create such social relationships with the team.

Psychological Safety in Virtual Teams

In terms of a virtual team context, people's intention to share knowledge is positively influenced by their perceived levels of psychological safety. Prior researchers have taken a different theoretical perspective in the study of knowledge sharing behavior within virtual teams considering psychological safety. The social capital theory (Chiu, Hsu, & Wang, 2006; Wasko & Faraj, 2005), social cognition theory (Chiu et al., 2006), motivation theories (Wasko & Faraj, 2005), and trust theories (Ridings, Gefen, & Arinze, 2002) were used to understand the role of learning among virtual teams. However, they neglected to address the critical role of psychological safety. A recent study by Kirkman, Cordery, Mathieu, Rosen, and Kukenberger (2013) revealed the impact of national diversity on performance and found a curvilinear (U-shaped) relationship moderated by both media richness and psychological safety. This indicates the necessity of addressing the climate of psychological safety in virtual team learning.

A key prerequisite of the team's shared leadership capacity is by creating a team psychologically safe environment as a team and motivation to work together toward an exciting common goal (Day, Gronn, & Salas, 2004). The concept of shared leadership is explored in the next section, which can reduce the faultline and increase virtual team

learning and processes. Shared leadership can be distributed when there exists psychological safety among team members. Under a psychologically safe environment, team members can help their teams to better utilize individual differences and expertise. This climate helps teams to seek creative ideas without fear of being penalized. Also, a psychologically safe environment can enhance shared leadership, which can stimulate team members to discover new and better ideas and explore new approaches (Bass & Avolio, 1990; Shin & Zhou, 2003), and in turn to appreciate one another's different perspectives. Members can respect other members' viewpoints, and they are prepared to undertake the responsibility of their commitment.

While it seems that a positive mood among team members can often foster cooperation and increased participation, team research has shown that a negative climate can likewise result in less motivation and lower team performance (Zaccaro, Rittman, & Marks, 2001). Negative communication behavior was shown to have negative effects on team members, resulting in embarrassment and a consequential reduction in confidence (Cole & Crichton, 2006). Thus, for teams with high psychological safety, team members are more likely to share knowledge and practice shared leadership, which enable them to work together, learn faster, leverage their diverse perspectives, and combine their ideas into something new and useful. Therefore, this paper assumes that shared leadership can reduce faultline barriers and increase effective team processes.

The shared leadership framework will be explored next as a team process enabler. Followed by this shared leadership section, the team process factors that can disable team learning and performance will be discussed.

Shared Leadership

Over the last two decades, advancements in technology have supported the trend toward geographically dispersed work groups collaborating through technology. The lack of face-to-face interaction in virtual teams influences social processes and collaboration effectiveness (Hertel et al., 2005; Hinds & Mortensen, 2005). The lack of development of a social network and absence of trust hindered the knowledge sharing in virtual teams around the world (Newell, David, & Chand, 2007; Pinjani & Palvia, 2013). Therefore, developing leaders in a virtual team setting has emerged as a new area of inquiry in the field of human resource development to enhance the social and task processes.

However, few scholars have examined team leadership with an emphasis on VTs (Barnwell, Nedrick, Rudolph, Sesay, Wellen, 2014; Brake, 2006; Kayworth & Leidner, 2002). Effective VT leaders can demonstrate the capability to deal with issues by performing multiple leadership roles simultaneously (Kayworth & Leidner, 2002). For example, highly effective VT leaders can (a) act in a mentoring role, (b) assert their authority, (c) provide regular, detailed, and prompt communication with their peers, and (d) articulate role responsibilities among the VT members (Kayworth & Leidner, 2002). Likewise, it is necessary to look more closely at existing leadership

development theories and practices to provide leadership development scholars and practitioners with new ideas of research and practice.

Shared Team Leadership Defined

Most of the work on leadership has been conducted on vertical leadership in which one individual projects downward influence on individuals (Pearce & Sims, 2002). However, as teams become more complex, vertical leadership may not be the most effective way to lead teams. Instead, shared leadership was found to be more effective than the traditional process of vertical leadership (Pearce & Sims, 2002). A growing number of researchers have examined shared leadership in work teams (i.e., collective leadership, and distributed leadership). Other scholars also noted that shared team leadership can have an impact on team effectiveness (Day, Gronn, & Salas, 2004; Marks et al., 2001; Mathieu, Maynard, Rapp, & Gilson, 2008).

A definition of shared leadership from Carson, Tesluk, and Marrone's (2007) study was chosen for this study. They defined shared leadership as an emergent team property that results from the distribution of leadership influence across multiple team members. According to their view, leadership originates from individual team members taking responsibility for activities that influence the other team members through interaction. The resulting system can be viewed as a leadership network that shapes and influences the whole team's actions and outcomes. More recent definitions focus on leadership associated with change management, vision building, or empowerment (Yoo & Alavi, 2004).

The concept of shared leadership is based on the notion that more than one member of the team can lead, and leadership is distributed among team members (Pearce & Sims, 2002). The integration of shared leadership definitions by numerous scholars was summarized by Carson, Tesluk, and Marrone's (2007), and D'Innocenzo, Mathieu, and Kukenberger (2014). The summarization is presented in Table 1. Although a variety of definitions of shared leadership have recently been offered by many scholars, similar characteristics among these definitions can be identified. First, shared leadership focuses on a relational whole rather than parts because it acknowledges the interdependent nature of leadership, which can be attained by collective achievement, shared responsibility, and the importance of teamwork (Pearce & Sims, 2002). Models of shared leadership emphasize the need to distribute the tasks and responsibilities of leadership up, down, and across the hierarchy. That is, shared leadership emphasizes leadership as social interactions through relationships and networks. The members play a role in influencing and creating leadership rather than a focus on the leader's effect on followers.

Another important aspect of shared leadership has to do with the learning process for the team members and the organization (Marsick & Watkins, 1999; Senge, 1990). Models of shared leadership focus on mutual learning, collective learning, greater shared understanding, and eventually, positive action (Otto Scharmer, 2001). Developing shared leadership behavior enhances team members' skills by providing feedback about effective and ineffective behavior and by demonstrating appropriate behavior.

Table 1
Integration of Shared Leadership Definitions

Study	Definition
Avolio, Jung, Murry, & Sivasubramanium (1996)	No explicit definition given, but shared leadership is essentially viewed as transformational leadership manifested at the group level in highly developed teams.
Gerstner (1998)	Viewed as a network of dyadic working relationships between work group members.
Pearce & Sims (2002)	Distributed influence from within the team (p. 172). Lateral influence among peers (p. 176).
Sivasubramanium, Murry, Avolio, & Jung (2002)	Collective influence of members in a team on each other (p. 68). How members of a group evaluate the influence of the group as opposed to one individual within or external to the group (p. 68).
Pearce & Conger (2002)	A dynamic, interactive influence process among individuals in groups for which the objective is to lead one another to the achievement of group or organizational goals or both.. . . [Leadership is broadly distributed among a set of individuals instead of centralized in [the] hands of a single individual who acts in the role of a superior (p. 1).
Pearce, Yoo, & Alavi (2004)	Simultaneous, ongoing, mutual influence process within a team that is characterized by "serial emergence" of official as well as unofficial leaders (p. 48).
Ensley, Hmieleski, & Pearce (2006)	Team process where leadership is carried out by the team as a whole, rather than solely by a single designated individual (p. 220).

Table 1
Continued

Study	Definition
Mehra, Smith, Dixon, & Robertson (2006)	Shared, distributed phenomenon in which there can be several (formally appointed and/or emergent) leaders (p. 233).
Carson, Tesluk, & Marrone (2007)	An emergent team property that results from the distribution of leadership influence across multiple team members.
Méndez (2009)	A dynamic property that is not owned by any particular team member but flows among multiple people and adapts to the characteristics of the situation.
Gupta, Huang, & Yayla (2011)	Team's capability for collectively engaging in transformational leadership behaviors; leadership as a collective process, such that the team influences, inspires, and motivates team members.
Zhou (2012)	The distribution of leadership influence across multiple team members.

The Role of Shared Leadership

Evaluating the impact of shared leadership on team effectiveness is dependent on what outcomes are valued as well as the source of the evaluation (Pearce &Sims, 2002). According to meta-analytic research, shared leadership in teams is essential to goal achievement and team effectiveness (Wang, Waldman, & Zhang, 2014). The shared leadership approach has been demonstrated to be positively associated with team effectiveness throughout various organizational settings and different types of teams (Ensley, Hmieleski, & Pearce, 2006; Hoch et al., 2010; Pearce & Sims, 2002). Pearce and Sims (2002) reported that shared leadership behaviors are positively related to team effectiveness as perceived by team managers, members, and customers.

Beyond organizational settings, shared leadership in teams of undergraduate students in higher education was positively correlated with self-reported ratings of effectiveness (Avolio, Jung, Murry, & Sivasbramaniam, 1996). In Carson et al.'s (2007) study, they found that internal team environment, consisting of shared purpose, social support, and voice, and external coaching were important predictors of shared leadership emergence, which predicted team performance. However, shared leadership does not always produce positive team results. Boies et al. (2010) reported that shared leadership using a transformational leadership dimension had negative impacts on team performance.

In the leadership literature, Day et al. (2004) noted that over time, a team can develop leadership capacity within the team, which entails shared and distributed leadership among the team's members. A key prerequisite of the team's leadership capacity was shared a collective identity as a team and motivation to work together toward an exciting common goal (Day et al., 2004). Therefore, team members need to acquire leadership skills so that they are capable of performing shared and distributed team leadership.

Scholars have also suggested that shared leadership can affect both team and individual outcomes (Nicolaides, LaPort, Chen, Tomassetti, Weis, Zaccaro, & Cortina, 2014), and vertical teams demonstrate a positive influence on team-level performance than traditional hierarchical leader teams (Carson et al, 2007). However, up to this stage of research, the fundamental question of what the shared leadership means and how shared leadership relates to team performance is not clear.

Conceptually, relation-oriented and task-oriented leadership have been part of the research literature since the 1950s (e.g., Halpin, 1955) but focused on the style of a formal leader. Bass (1991) suggested the distinction between these two orientations represented transactional and transformational leadership, these two styles of leadership at the individual level have been compared by a number of studies.

Leadership at the individual can be categorized into two different styles: task-related and socio-emotional leadership, which impact team processes. Task-oriented leadership is concerned with accomplishing the task in an efficient way. Behaviors related to task-oriented leadership are coordination activities, such as organizing work, assigning work to team members, and explaining rules and standard procedures (Yukl, 2006). Leaders typically build a structure initially to enable team members to coordinate and cooperate among themselves. Explicit communication on what needs to be done and how it should be done is needed to promote effective team performance. Hynes, Kissoon, Hamielec, Greene, and Simone (2006) reported a lack of effective delegation and communication skills to be an important characteristic of inappropriate team leadership, which results in a poor team climate and unfavorable consequences for team performance.

On the other hand, the aim of socio-emotional leadership behavior is to increase mutual trust, cooperation, and team satisfaction, and building commitment to work objectives with the team. Effective leaders use a variety of socio-emotional behavior, such as supporting or developing team members (Yukl, 2006). A supportive leader typically practices these characteristics: being friendly, cooperative, and showing

consideration and concern for the needs and feelings of team members (Yukl, 2006). Several researchers have examined the role of leaders' affective and motivational behavior. For instance, Thilo (2005) described the importance of the leader's use of emotion on team performance. Appropriate humor may be used to lighten the situation of stress and to enhance the team atmosphere. Thilo (2005) holds that the team leader is responsible for setting the emotional tone of a team and keeping emotions positive. Similarly, Cooper and Wakelam (1999) addressed the importance of motivating and encouraging team members.

In contrast, shared leadership emerged as a team performance factor fairly recently (e.g., Pearce, 2004; Pearce & Conger, 2002). However, empirical studies of the two dimensions of shared leadership have been rare, so this study can be critical by examining the effects of these two dimensions of shared leadership on team performance. This study is the first study to combine two dimensions of Grille and Kauffeld's (2015) shared leadership scales.

Task-oriented shared leadership (TOSL). A task process consists of the activities that team members deliberately execute to achieve a goal. TOSL indicates team members sharing a concern for achieving a good standard of performance. Behaviors related to task-oriented leadership include coordination activities, such as organizing work, assigning work to team members, and explaining rules and standard procedures (Yukl, 2006). Coordination refers to the activities orchestrating the sequence and timing of interdependence (Zalesny, Salas, & Prince, 1995). According to McGrath (1990), the coordination mechanisms include schedule deadlines,

coordinated pace of effort within and between members, and specification of time spent on specific tasks.

Initially, leaders typically build a structure to enable team members to coordinate and cooperate among themselves. Explicit communication supports what needs to be done and how it should be done to promote effective team performance. To explain whether and how TOSL relates to team performance, the information exchange perspective was adopted (Mesmer-Magnus & DeChurch, 2009), which covers knowledge exchange and task-oriented coordination processes (Smith, Collins, & Clark, 2005). Information exchange is an important process linked to team performance because sharing task-relevant information leads to more thorough and creative information processing, problem-solving, and decision making (Van Knippenberg et al., 2004).

Relation-oriented shared leadership (ROSL). Relation-oriented team processes enhance the emotional strength of a team, such as support and collaboration, resulting in both positive team attitudes and increased performance (Mannix & Neale, 2005). Relation-oriented leaders appreciate and respect team members' opinions and connect emotionally to members; both of which are important for teamwork outcomes (Yukl, Gordon, & Taber, 2002). Effective team members practice a variety of positive socio-emotional behaviors, such as supporting team members and showing consideration for the needs and feelings of team members (Yukl, 2006). Likewise, shared team leadership is one of the important process factors that leads to team effectiveness. According to a meta-analysis paper with 42 independent samples of

shared leadership, shared traditional forms of leadership (e.g., initiating structure and consideration) showed a lower relationship ($\rho = .18$) than either shared new-genre leadership (e.g., charismatic and transformational leadership; $\rho = .34$) or cumulative, overall shared leadership ($\rho = .35$) (Wang, Waldman, & Zhang, 2014). Therefore, it is important to examine what team members share in what kind of context, and learn how shared leadership affects different output variables.

Shared Leadership in Virtual Teams

In today's Internet-enabled world, virtual project teams have become common in many contemporary organizations, including private or public institutions. More and more teams and leaders are geographically dispersed, and much more team interaction occurs through electronic means. Internal virtual tools (such as discussion forums) made available to enable team members to exchange information and knowledge. These online activities help overcome time and space limitations and serve as knowledge sharing tools for team members (Ardichvili, Page, & Wentling, 2003) or e-learning tools for students in higher education institutions (Wachter, Gupta, & Quaddus, 2000).

Virtual teams present numerous challenges by the nature of electronic communication, such as difficulty in establishing a common purpose, unclear role expectations, and lack of motivation and trust (Huang, Kahai, & Jestice, 2010). Therefore, the role of leadership has been emphasized to overcome these barriers and improve team performance (Joshi, Lazarova, & Liao, 2009; Kayworth & Leidner, 2000).

To increase the effectiveness of teamwork, leadership has received substantial attention as a key determinant of team performance (David & Bryant, 2003; Kayworth & Leidner, 2002; Pauleen, 2002). Leaders possess the power of changing the climate and promoting individuals' behavioral changes (Rondinelli & Heffron, 2009). Leaders make differences in team performance as they facilitate members' engagement in teamwork processes (Cascio & Shurygailo, 2003). Moreover, from a socio-technical systems approach, leaders play a pivotal role in aligning and bridging gaps between technological, environmental, and social systems, which impact success (Avolio, Kahai, & Dodge, 2001).

Even if some researchers have examined the effects of shared leadership on team process effectiveness, little systematic evidence exists regarding the effectiveness of virtual team processes. With respect to virtual teams, Pearce, Yoo, and Alavi (2004) found that shared leadership was positively related to enhanced team processes, using a sample of 28 teams. Balthazard, Waldman, Howell, and Atwater (2004) compared virtual teams with face-to-face teams in regards to the effects of shared leadership on team processes. They found that face-to-face teams were more likely to demonstrate higher levels of shared leadership than were virtual teams. In turn, shared leadership were shown to positively predict team cohesion (Balthazard et al., 2004). According to Hoch and Kozlowski (2014), shared team leadership was significantly related to team performance regardless of the degree of virtuality. They reported that shared leadership influenced virtual teams more consistently across a virtual team context than teams that had vertical and hierarchical leadership styles. Results from the previous studies are

still addressing research extensions for understanding shared leadership processes in virtual teams and practical implications for leading virtual teams.

Since the definitions of shared team leadership were explored in a broad sense, it is important to understand shared team leadership in a more specific setting. Leadership is crucial for virtual teams (Lipnack & Stamps, 1997; Symons & Stenzel, 2007). These proponents argue that leadership development for virtual teams should focus on shared leadership because it helps the dispersed team to work as a collection of roles and behaviors that can be split, shared, and rotated, with multiple leaders existing within a team at any given time or location (Gibson & Gibbs, 2006). Kayworth and Leidner (2002) suggested that adopting leadership in diverse virtual teams can help minimize the challenges of managing and working in virtual teams dispersed across different time zones. However, researchers on shared leadership have not yet explored its impact on virtual teams' outcomes (Pearce & Conger, 2002).

Regardless of a virtual or collocated team setting, every leader shares similar roles or responsibilities to perform, and these are traditionally categorized as task-oriented or relationship-oriented behaviors (Kayworth & Leidner, 2002; Yukl, Gordon, & Taber, 2002). However, virtual team leaders face additional and unique challenges in implementing those responsibilities as they have limited opportunity for face-to-face interaction with team members and access to their social clues (Brake, 2006; Malhotra, Majchrzak & Rosen, 2007). Thus, leaders must determine what actions or interventions need to be conducted through electronic communication. It is challenging for virtual team leaders to establish the sense of their presence (i.e., telepresence) to team

members in an electronic context, whereas traditional team leaders can do that easily by just physically being there (Zigurs, 2003). With these reasons, Avolio and colleagues (2001) argued that advanced information technology has created a new context that changes the nature of leadership. They also utilized the term 'e-leadership' to describe leadership in virtual teams and defined it as "a social influence process mediated by advanced information technology to produce a change in attitudes, feelings, thinking, behavior, and/or performance with individuals, groups, and/or organizations" (p. 617).

Researchers have attempted to address leadership capabilities or strategies required to lead a virtual team effectively. For example, Davis and Bryant (2003) presented behaviors for leading virtual teams across organizational, team, dyad, and individual levels. They also discussed the model through Full Range Leadership (i.e., laissez-faire leadership, transactional leadership, and transformational leadership) and through communication and collaboration technology, knowledge management, culture, and the team life cycle. They also analyzed the team, dyadic (e.g., leader-member exchange theory), and individual (e.g., distributed leadership) levels of leadership. They reported Laissez-faire leadership to be less effective than transactional leadership and transformational leadership in the context of leading virtual teams. Leaders have to choose various tools, either synchronous or asynchronous, considering information richness, social presence, implementation, and work to promote team learning.

Even though Davis and Bryant's (2003) study indicated a high similarity of leadership capabilities between virtual and traditional face-to-face teams (i.e., task-oriented, relationship-oriented) from the behavioral perspective of leadership, Kayworth and Leidner (2002) argued that the emphasis of certain roles may differ in virtual settings, supported by the contingency and situational leadership perspective. Specifically, communication and social facilitation capabilities are more valued in a virtual team. They accentuated the importance of behavioral complexity as effective leaders often perform contradictorily and compete for role behaviors. For example, subordinates perceived a leader to be effective when he or she demonstrates authoritative behaviors, but being empathetic at the same time.

Mukherjee, Lahiri, Mukherjee, and Billing (2012) suggested cognitive, social, behavioral capabilities from the perspective of transactional and transformational leadership differ across five stages of a team's life cycle (i.e., preparations, launch, performance management, team development, and disbanding). They defined cognitive capabilities as abilities to reflect, analyze, and synthesize information, social capabilities as interpersonal skills and social manners, and behavioral capabilities as enablers of influencing others to think and function. For example, at the preparation stage, leaders utilize their judgmental skills to plan and design virtual teams, relying on cognitive leadership capabilities, rather than social and behavioral capabilities.

In some laboratory studies, researchers found how leadership in terms of transactional, transformational, participative, and directive style may affect VT interaction and performance in computer-mediated teams (e.g., Kahai & Avolio, 2006;

Kahai, Sosik, & Avolio, 2003). Davis and Bryant (2003) found that team leaders displaying transformational leadership characteristics had more effective and committed teams. Kirkman, Rosen, Gibson, Tesluk, and McPherson (2002) interviewed members and leaders of 65 VTs in a single organization and found five broad challenges of VTs as opposed to specific effective and ineffective VT leadership behaviors.

In summary, despite the current criticism by some scholars that virtual team leadership capabilities are similar to those for traditional teams, virtual team leadership is different in important ways. Virtual teams present a unique situation or context where leaders must consider technology availability, culture, time/geographic differences, and team life cycle. Therefore, exploring the effect of virtual team leadership to team performance is necessary for each different context.

Task-related Processes

In a virtual team setting, many researchers address the importance of communication and knowledge sharing as team process factors that influence team performance. These factors are considered as task-related behavior in which teams engage. Task-based and socio-emotional communication are two types of communication and their effects illustrate the importance of communication (Monalisa, Daim, Mirani, Dash, Khamis, & Bhusari, 2008). Early and frequent task-related communication plays a critical role in forming the initial beliefs and trust of team members about each other's specialized knowledge (Kanawattanachai & Yoo, 2007).

In addition, knowledge sharing as one of the task-related processes plays an important role in the development of virtual teams. Knowledge in virtual teams is created by team members' knowledge-sharing behaviors through socialization and mutual understanding (Lee, Vogel, & Limayem, 2003). Socialization can help understand cultural differences and foster a climate of exchange of ideas and build trust (Olson & Olson, 2006). Anklam (2002) claims that people collaborate and share knowledge with those they know and trust. Likewise, a great deal of researchers have investigated the factors influencing knowledge sharing behavior in virtual teams from various theoretical perspectives. Some of them focus on inherent motivational factors (Wasko & Faraj, 2005), while many others focus on interpersonal conditions that can shape knowledge sharing, such as social capital (Chiu et al., 2006; Wasko & Faraj, 2005), social cognition (Chiu et al., 2006; Hsu et al., 2007), trust (Ridings et al., 2002), or social network (Wasko, Faraj, & Teigland, 2004).

Task-related Process Challenges in Virtual Teams

Researchers suggest that diversity affects a variety of team processes regarding task oriented and socio-emotional reactions (Connaughton & Shuffler, 2007), which in turn influence team performance (Mannix & Neal, 2005). Han and Beyerlein (2016) found several more factors under task-related processes in a virtual setting that impact team performance. They identified a list of eight critical VT process factors within a frame of task and socio-emotional processes.

Under a task process, four task process factors were identified: task-related communicating, coordinating, establishing expectations, and knowledge sharing. A

task process indicates how team members can achieve a goal. Han and Beyerlein (2016) identified several VT process challenges, and the authors reduced to four categories based on the commonalities of the task-related process barriers (Table 2).

Table 2
Virtual Team Task Process Challenges

VT Task Process Factors	Challenges faced by VTs	Source
Task-related communicating	- Communication problems and misunderstandings - Magnified task conflict - Dependence on early and frequent task-oriented communication	Berg, 2012; Chang et al., 2011; Chiu & Staples, 2013; Cordery et al., 2009; Dineen, 2005; Gibson & Gibbs, 2006; Johansson et al., 1999; Kanawattanachai & Yoo, 2007; Kankanhalli et al., 2006; Kayworth & Leidner, 2000; Kayworth & Leidner, 2002; McDonough et al., 2001; Monalisa et al., 2008; Oertig & Buergi, 2006; Shachaf, 2005; Shachaf, 2008; Suchan & Hayzak, 2001; Van Ryssen & Godar, 2000
Coordinating	- Coordination difficulties due to power, culture, and communication - Issues with keeping on schedule and staying on budget - Different preferences for a selection of communication media	Cordery et al., 2009; Gibson & Gibbs, 2006; Johansson et al., 1999; Kayworth & Leidner, 2000; Maznevski & Chudoba, 2001; McDonough et al., 2001; Van Ryssen & Godar, 2000
Establishing expectations	- Difficulties in norming due to various standards of acceptable behavior and cultural norms - Challenges in establishing expectations around knowledge sharing due to in-group/out-group dynamics	Fain & Kline, 2013; Gibson & Gibbs, 2006; Johansson et al., 1999; Krumm et al., 2013; McDonough et al., 2001

Table 2
Continued

VT Task Process Factors	Challenges faced by VTs	Source
Knowledge sharing	- Difficulties in keeping project goals stable - Reduced information flow due to in-group/out-group perceptions and cultural differences - Uneven distribution of information due to differences in the salience of information among members and relative differences in speed of access to information	Cramton, 2001; Gibson & Gibbs, 2006; Newell et al., 2007; Pinjani & Palvia, 2013; Robey, Khoo, & Powers, 2000; Umans, 2008

Task-related communicating. One of the task process factors is task-related communication. A few researchers revealed the advantages of VT communication. Several researchers noted that cultural differences are less noticeable in written communication, which enhances communication quality (Kankaanranta & Planken, 2010). Electronic media may also increase the perceived similarity among members from different countries (Jarvenpaa & Leidner, 1998). For example, the lack of nonverbal (e.g., dressing and greeting) and verbal cues (e.g., accent) eliminates surface-level diversity. Asynchronous communication seems to have a positive effect on communication regarding language accuracy and in mitigating intercultural miscommunication because members have more time to process a message (Gareis, 2006).

However, many scholars note communication is a major concern for VTs due to language differences and different communication styles in global VTs (Gibson &

Gibbs, 2006). These findings coincide with the existing literature summarized in Table 3. Most research noted that reduced social context cues and the utilization of weaker communication media can hinder team processes and performance. Textual misinterpretation and the loss of nuances in face-to-face communication can be another problem (Berg, 2012).

Coordinating. Coordination refers to managing the sequence and timing of interdependent work (Zalesny, Salas, & Prince, 1995). According to McGrath (1990), the coordination mechanisms include schedule deadlines, coordinate pace of effort within and between members, and specification of time spent on specific tasks. A coordinating process can be affected by factors, such as different time zones, gaps among technology infrastructures, geographic dispersion, and differences in technology proficiency among team members (Gibson & Gibbs, 2006; Kayworth & Leidner, 2000). When it comes to members' cultural differences, management and coordination of VTs become extremely complex (Kayworth & Leidner, 2000). A number of VT researchers reported that cultural differences lead to coordination difficulties (Table 2). For example, each culture's religious beliefs can increase coordination difficulties because leaders need to consider religious holidays when scheduling events (Anawati & Craig, 2006).

Establishing expectations. When different cultures are united as a team, norming and goal setting procedures can be challenging because the members may lack shared meaning, language, pattern, and routine needed to agree on a shared goal (Pauleen, 2004). VTs may even have issues dividing tasks, coordinating work,

handling conflict, and formulating rules. Negotiating different visions of team members into a coherent and workable scheme is also challenging (Pauleen, 2004). Krumm et al. (2013) suggested that VTs need to form and adhere to norms based on knowledge, skills, and abilities (KSAs). Establishing norms around communication patterns can be helpful in VTs as well (Kirkman et al., 2002).

Knowledge sharing. Virtual knowledge sharing tends to be less effective in VTs than traditional teams (Gibson & Gibbs, 2006; Martins et al., 2004; Mortensen & Hinds, 2001). Differences including values, expectations, perceptions, and behaviors can reduce the team's ability to share with one another. Differences in cultural norms and value around knowledge sharing influence in-group/out-group dynamics, which result in reduced information flow (Gibson & Gibbs, 2006; Newell et al., 2007). Also, the lack of development of a social network and absence of trust hindered the knowledge sharing in VTs (Newell et al., 2007; Pinjani & Palvia, 2013). Therefore, VTs face the challenges of building a knowledge sharing system.

Socio-emotional Processes

Social-emotional processes emphasize shared identity and trust among team members to promote team performance. There are several related theories used to explain the theoretical rationales for socio-emotional processes in this study. In addition to the previous theories, it is important to understand how and when team diversity causes social categorization, triggers intergroup bias, negatively affects team processes, gives rise to collaboration, and brings positive influences into team processes (Van Knippenberg et al., 2004). Regarding socio-emotional processes, the

emotional strengths of a team, such as support and collaboration, not only create positive team attitudes but also contribute to increased performance (Mannix & Neale, 2005). To explore a team shared identity and trust process factor, the social identity theory and the concept of swift trust have been described in this section.

First, the social identity theory has been used as theoretical framework to explain a team shared identity and trust process factor. The social identity theory (Tajfel & Turner, 1986) is used to explain when and how individuals identify and behave within social groups. The social identity theory argues that people categorize themselves as part of either the in-group or the out-group based on the characteristics of others in each group. Social group identities include such dimensions as family, community, nationality, race, ethnicity, age, religion, gender, physical and mental ability, sexual orientation, marital and family status, socio-economic class, educational level, language, geographic location, military status, job function, and job level. Williams and O'Reilly's (1998) review of the demography literature noted that perceptions of otherness within a team have been shown to lead to decreased satisfaction with the team, increased turnover, lowered team shared identity, reduced team communication, decreased cooperation, and higher levels of conflict, which reduces the level of trust. In virtual teams, where individuating cues about others are limited, individuals build stereotypical impressions of others based on limited information (swift trust). However, it is not clear yet whether the self-categorizing of team members has a positive effect on team performance or not because the boundary

of virtual teams is more intangible than the boundary of traditional teams. Therefore, it is more difficult to establish the social identity of virtual team members.

Second, the concern of the swift trust theory is how to maintain trust in virtual teams. Virtual teams are known to develop swift trust rather than cognitive or affect-based trust. The concept of swift trust applies to virtual teams because members tend to rely on stereotypical impressions of members in deciding whether or not to trust (Jarvenpaa, Knoll, & Leidner, 1998). Jarvenpaa and Leidner (1999) suggested trust in virtual settings is swift and fragile. Meyerson, Weick, and Kramer (1996), who developed the concept of swift trust, suggested that if the common task requires trust, but the parties do not have time to become acquainted with each other, trust is built on role-based interaction and prototypical categorizations. Team members, who have not yet built confidence in the integrity of their members, are required to suspend uncertainty to achieve the established work goals (Germain, 2011). Likewise, the theoretical background of socio-emotional team processes supports the idea of challenges in virtual teams. Next, the detailed evidence derived from the existing empirical studies on socio-emotional process challenges in virtual teams will be discussed.

Socio-emotional Process Challenges in Virtual Teams

A socio-emotional process of a team relates to relationships among group members (Barsade & Gibson, 2012; Elfenbein & Shirako, 2006). The previous studies in VTs have shown the socio-emotional process influences interpersonal relationships differently compared to homogenous teams (Glikson & Erez, 2013). Some scholars

discovered that strong interpersonal relationships can be developed in computer-mediated environments as they are in face-to-face settings (Kahai & Cooper, 2003). For example, emotional processes, such as happiness and anger, can be powerful and influential in VTs through text-based communication (Cheshin, Rafaeli, & Bos, 2011).

In Han and Beyerlein's (2016) literature review, they summarized several VT process challenges, which the authors narrowed down to four categories of the socio-emotional process barriers (Table 3). By synthesizing 60 empirical articles, they identified four socio-emotional process factors: overcoming biases, building relationships, developing trust, and intercultural learning. In this section, each factor is examined to explain virtual team process dynamics.

Table 3
Virtual Team Socio-emotional Process Challenges

VT Socio-emotional Process Factors	Challenges faced by VTs	Source
Overcoming biases	- Unhealthy racial and national stereotypes - Lack of social information due to cultural differences - Conflict due to in-group/out-group dynamics	Anawati & Craig, 2006; Au & Marks, 2012; Berg, 2012; Chiu & Staples, 2013; Fain & Kline, 2013; Gibson & Gibbs, 2006; McDonough et al., 2001; Mortensen & Hinds, 2001; Newell et al., 2007; Panteli & Davison , 2005; Polzer et al., 2006
Building relationships	- Relationship conflict due to cultural diversity - Lack of shared beliefs/experiences for developing interpersonal relationships	Cordery et al., 2009; Daniel et al., 2013; Glikson & Erez, 2013; Kankanhalli et al., 2006; Lurey & Raisinghani, 2001 ; McDonough et al., 2001; Newell et al., 2007; Ocker et al., 2011; Pauleen, 2003; Sivunen, 2006; Van Ryssen & Godar, 2000

Table 3
Continued

VT Socio-emotional Process Factors	Challenges faced by VTs	Source
Developing trust	- Few informal messages or little social information, which can reduce trust - Reliance on a cognitive more than an affective element for trust	Connaughton & Daly, 2004; Holtbrügge et al., 2011; Jarvenpaa & Leidner, 1999; Kanawattanachai & Yoo, 2002; Kirkman et al., 2002; McDonough et al., 2001; Oertig & Buergi, 2006; Peters et al., 2009; Pinjani & Palvia, 2013; Polzer et al., 2006
Intercultural learning	- Intercultural misunderstandings - Conflicts due to communication style differences - Impaired decision quality	Anawati & Craig, 2006; Dekker et al., 2008; Fain & Kline, 2013; Gibson & Gibbs, 2006; Glikson & Erez, 2013; Hardin et al., 2007; Holtbrügge et al., 2011; Jarvenpaa & Keating, 2011; Mockaitis et al., 2012; Monalisa et al., 2008; Mortensen & Hinds, 2001; Paul et al., 2005; Robey, Khoo, & Powers, 2000; Shachaf, 2008; Umans, 2008

Overcoming biases. Typical challenges of VTs in the initial stages of team processes are due to the perception of cultural differences. VT members share little social information that provides the basis of personal friendship and trust (Newell et al., 2007). Due to global team members' different backgrounds and beliefs, team members tend to increase conflict (Chiu & Staples, 2013; Polzer, Crisp, Jarvenpaa, & Kim, 2006) and have unhealthy racial and national stereotypes (Au & Marks, 2012). As a result of perceiving cultural differences, the emergence of subgroups can create

in-group/out-group structure, which reduces information flow and knowledge sharing (Gibson & Gibbs, 2006; Newell et al., 2007). This may complicate the relationships on the team (McDonough, Kahnb, & Barczaka, 2001), reduce trust, and impair decision process quality (Chiu & Staples, 2013).

Building relationships. Team processes and team member relations are the strongest connections to team performance and team member satisfaction (Lurey & Raisinghani, 2001). This is an interesting finding because of an analysis of predictor variables, such as the design process, other internal group dynamics, and additional external support mechanisms, depicted weaker relations (Lurey & Raisinghani, 2001). Some researchers demonstrate how differences in cultural backgrounds affect group process and effectiveness when working with VTs. Team building activities were found to be more necessary in a virtual setting than face-to-face meetings because people are not used to spending time and effort getting to know each other in such a context (Sivunen, 2006). To increase social interaction and relationships, scholars suggested to encourage team members to examine their own personal culture and share their prior experiences in working with culturally diverse groups (Humes & Reilly, 2008; Pauleen, 2003). However, other researchers demonstrated that national culture differences were the most disruptive factor in building social relationships, and that relationship building or cultural training actually increased the negative influences to VTs (Newell et al., 2007).

Developing trust. According to Newell and Swan (2000), traditional models of trust have a three-fold typology: commitment (agreement), companionship (personal

friendships), and competency trust (ability on task). However, VTs may develop trust differently from teams that interact frequently face-to-face. Some researchers indicate face-to-face teams are more likely to develop trust via socio-emotional process, whereas VTs are more likely to develop trust when sharing timely information and having appropriate responses to electronic communication (Kirkman et al., 2002). Trust appears to be fragile and temporary in VTs according to the results of case studies (Jarvenpaa & Leidner, 1998; Jarvenpaa, Knoll, & Leidner, 1998; Polzer et al., 2006). Therefore, VTs are known to develop "swift trust" rather than cognitive- or affect-based trust because team members, who have not yet built confidence in the ability of others, are required to suspend uncertainty to achieve the established work goals (Germain, 2011).

Intercultural learning. VTs can cause intercultural misunderstandings due to communication style differences (Holtbrügge & Schillo, 2011; Monalisa et al., 2008; Shachaf, 2008). To overcome these misunderstandings, VT members can choose to adapt and change their behavior as well as allow for religious beliefs and time zone differences to improve processes with team members from different cultures (Anawati & Craig, 2006). Anawati and Craig (2006) found that the majority of VT members wanted their team members to be aware of their own culture. The ethnic diversity in virtual teams can lead to more informal and open communication, which creates an atmosphere for intercultural learning (Umans, 2008). Depending on the length of time in VTs, the results show the longer members have been on their teams, the more likely

they are to want their team members to be aware of their culture (Anawati & Craig, 2006).

National and cultural heterogeneity in virtual teams adds more complexity to team members' relations, collaboration dynamics, and team performance (Pauleen, 2004). VT literature reveals inconsistent effects for cultural diversity across different contexts with both positive and negative impacts (Shachaf, 2008). People typically interpret information based on their cultural values and biases, which leads to misinterpretations (Pauleen, 2004). Perceived differences in national cultures can lead to unhealthy stereotypes in VTs (Au & Marks, 2012). The challenges of virtual assignments are caused by the inability of partners to interact due to national cultural differences (e.g., interpretation problems, insufficient language skills, and a different context), more than by the insufficient manageability of technical systems (Holtbrügge & Schillo, 2011). For example, technical language violations (e.g., spelling and grammatical errors) in e-mail have been shown to form negative perceptions regarding agreeableness and trustworthiness (Vignovic & Thompson, 2010). Therefore, linguistic and national factors can create faultlines and result in both task and relationship conflict in the global VTs (Kankanhalli, Tan, & Wei, 2007).

Team Processes Framework

In the previous section, the broad categorization of processes into task-related and socio-emotional process processes has been discussed. In this section, the team processes framework involving the following four detailed process factors is presented from Figure 3: (a) behavioral, (b) affective, (c) motivational, and (d) cognitive

processes. In Figure 3, these process factors are drawn with dotted lines, which show interconnected characteristics among factors. Teamwork generally refers to behavioral processes that members use to accomplish interdependent work, and/or the affective, cognitive, and motivational states that emerge during the work. Despite many different models, team process researchers have distinguished cognitive, affective-motivational, and behavioral functions as keys to team effectiveness by enabling team members to combine their resources to resolve task demands (Ilgen et al., 2005; Kozlowski & Ilgen, 2006).

To facilitate team processes, shared group identity emerges when team members have a sense of: (a) a behavior component of joint effort, (b) an affective component of emotional attraction, (c) a motivational component of effort toward a common goal, and (d) a cognitive component of knowledge sharing, problem solving, and knowledge creation (Valentine et al., 2015; Zaccaro et al., 2001) as shown in Figure 3. In this figure, these process factors are drawn with dotted lines, which show overlapped and interconnected characteristics among factors. The four components of the framework represent a number of team processes that overlap to capture some of the complexity and dynamic of teams.

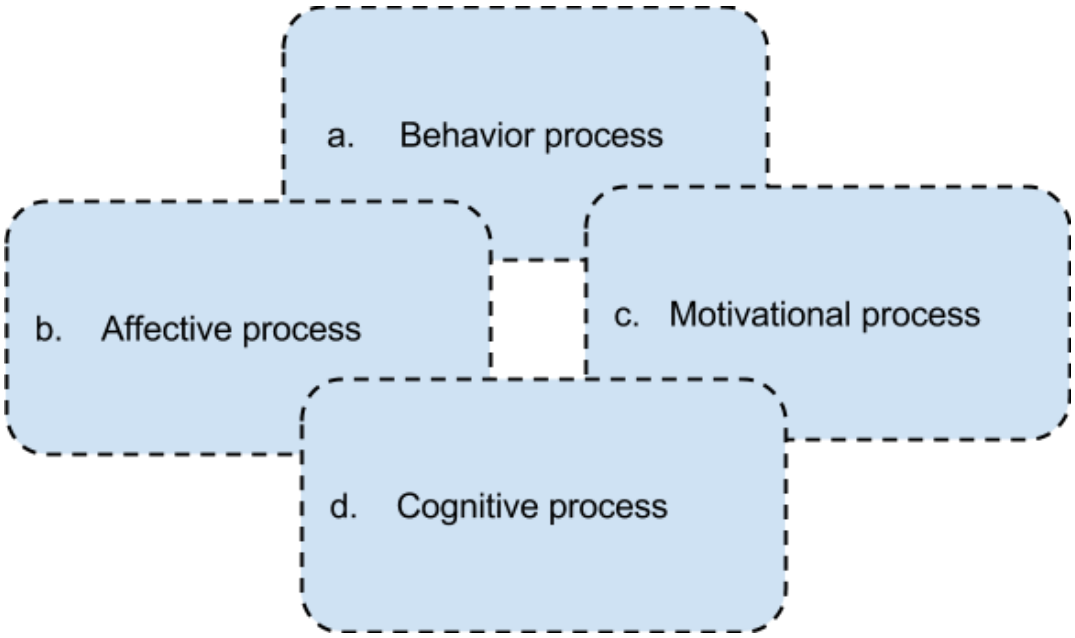

Figure 3. Team processes framework.

Team behavior process. Team behavior processes refer to the actions performed by team members to achieve a common goal (Salas & Cannon-Bowers, 2001). Behavior processes include actions, such as communication, coordination, and sharing expertise (Valentine et al., 2015). Successful virtual teams share several common behaviors among team members, such as task-related communication (Kanawattanachai & Yoo, 2007; Shachaf, 2008), decision making (Chiu & Staples, 2013; Shachaf, 2008), and conflict resolution (Montoya-Weiss, Massey, & Song, 2001; Mortensen & Hinds, 2001; Paul, Samarah, Seetharaman, & Mykytyn Jr, 2004). Based on Valentine et al.'s (2015) review of team survey instruments, the most commonly assessed behavioral dimensions of teamwork processes were communication and coordination. These behaviors are typically developed by leaders so it is important for leaders to facilitate the onset of effective behaviors.

Team affective process. Team affective processes refer to the socio-emotional states, such as trust, group emotions, or shared identity as part of the emotional climate of the group (Barsade & Gibson, 2012; Gully, Devine, & Whitney, 2012; Kasper-Fuehrer & Ashkanasy, 2001). Team affective processes can be represented in terms of perceived team support, which is related to building trust and shared identity (Kasper-Fuehrer & Ashkanasy, 2001). Based on Valentine et al.'s (2015) review of team survey instruments, the most commonly assessed affective dimensions of teamwork processes were respect, social support, and shared identity. For example, team cohesion refers to the degree to which team members desire to stick with the team (Gully, et al., 2012) and defined as the "sense of belonging" (Furumo & Pearson, 2006, pg. 2), which is an interpersonal factor that influences team performance. Having lower levels of team cohesion may be a result of interpersonal conflict within the team (Furumo & Pearson, 2006).

Team motivational process. Motivation represents the effort individuals will invest in a task. At the team level, motivational processes refer to team members' shared commitment to their shared goals which impacts the team's capacity to perform successfully (Kozlowski & Ilgen, 2006). Scholars have investigated the influence that team goal commitment may have on team performance (e.g., Hecht, Allen, Klammer, & Kelly, 2002). The development of the collective motivational process in a team setting may be challenging since they lack time for team building and interactions.

Team cognitive process. Team cognitive processes refer to the importance of knowledge in team functioning (DeChurch & Mesmer-Magnus, 2010). However, team

cognitive process has been the subject of little research because most researchers have restricted their studies to the individual level of cognitive process and mostly to the laboratory (Sacramento, Dawson, & West, 2008). Moreover, not many scholars have focused on the effect of team cognitive process in a virtual team environment, but it is necessary to study the team cognitive process in virtual teams because most virtual teams do knowledge work which involves sharing knowledge, learning from each other, and co-creating solutions to problems.

Knowledge sharing is a key cognitive process that guides effective teamwork (Shuffler et al., 2011). For example, team members attempt to yield new ways to combine existing ideas, procedures, and processes to arrive at creative solutions to problems (Sacramento, Dawson, & West, 2008). Cognitive functioning can also be represented in terms of team learning (Edmondson, 1999; Edmondson, Bohmer, & Pisano, 2001). Shared mental models emphasize knowledge or understanding that members have in common, which contribute to the team's performance (Kozlowski & Ilgen, 2006; Mohammed & Dumville, 2001). Shared mental models develop over time and serve as lenses that all members can use to make sense of information related to project goals.

As mentioned in the previous section, each process factor was categorized into four team processes: (a) behavioral, (b) motivational, (c) affective, and (d) cognitive processes. Each team process is divided into several process factors which are then tied directly to challenges identified in the cited literature (See Table 4). Clearly, there are a number of issues for team members to consider in developing effective team skills.

Table 4
VT Process Challenges

VT Processes	Process Factors	Virtual Team Challenges	References
Behavior process	Communicating	-VTs can cause communication problem, task conflict, and misunderstanding. -Fostering effective communication among VTs is more challenging than it is in collocated or virtual teams. -VT requires early and frequent task-oriented communication -Ethnic diversity leads to more informal and open communication in the teams.	Chang et al., 2011; Chiu & Staples, 2013; Johansson et al., 1999; Kanawattanachai & Yoo, 2007; Kankanhalli et al., 2006; Kayworth & Leidner, 2000; McDonough et al., 2001; Monalisa et al., 2008; Oertig & Buergi, 2006; Shachaf, 2005; Shachaf, 2008; Suchan & Hayzak, 2001; Van Ryssen & Godar, 2000
	Initiating task	-VT may contribute to task conflict. -Differences in cultural values, practices, and organizations impacted how the project task viewed, what knowledge was valued, and the recognition of an individual's contributions to the project.	Jarvenpaa & Keating, 2011; Kankanhalli et al., 2007

Table 4
Continued

VT Processes	Process Factors	Virtual Team Challenges	References
Behavior process	Coordinating	- VT process hinders coordination due to power, culture, and communication. - VT experiences issues with keeping on schedule and staying on budget. - VT requires thoughtful selection of communication media due to different preferences.	Johansson et al., 1999; Kayworth & Leidner, 2000; Maznevski & Chudoba, 2001; McDonough et al., 2001; Van Ryssen & Godar, 2000
	Using collaborative technology	-VT faces challenges of managing virtual aspects of communication. -Using collaborative technology hinders trust building. -VT can reduce team process losses associated with stereotyping, personality conflicts, power, politics, and critiques commonly experienced by face-to-face teams. -VT should improve language accuracy and mitigate intercultural miscommunication resulting from verbal differences among team members, and eliminates nonverbal differences by using e-mail.	Kirkman et al., 2002; Oertig & Buergi, 2006; Shachaf, 2005; Staples & Zhao, 2006

Table 4
Continued

VT Processes	Process Factors	Virtual Team Challenges	References
Motivational process	Goal-setting	-VTs face greater challenges in ensuring that project goals remain stable.	Gatlin-Watts et al., 2007; McDonough et al., 2001
	Norming	- VT finds difficulties in norming due to various standards of acceptable behavior and cultural norms. - VT faces challenges to establish expectations around knowledge sharing due to in-group/out-group dynamics.	Fain & Kline, 2013; Gibson & Gibbs, 2006; Krumm et al., 2013; McDonough et al., 2001
	Sharing identity	-VTs need to build shared identity as it is associated with less task conflict. -A strong sense of belonging to the global culture share their emotional norms strongly. -Strong norms enable the emergence of a global identity. - Individuals from different cultures are likely to show more agreement on the proper display norms for both positive and negative emotions for VTs rather than culturally homogeneous virtual teams.	Glikson & Erez, 2013; Mortensen & Hinds, 2001

Table 4
Continued

VT Processes	Process Factors	Virtual Team Challenges	References
Affective process	Promoting cohesion	- People tend to have relationship conflict due to cultural diversity. - VT members face challenges in developing interpersonal relationships due to the lack of shared beliefs/experiences.	Daniel et al., 2013; Glikson & Erez, 2013; Kankanhalli et al., 2006; Lurey & Raisinghani, 2001 ; McDonough et al., 2001; Newell et al., 2007; Ocker et al., 2011; Pauleen, 2003; Van Ryssen & Godar, 2000
	Building trust	- VT shares few informal messages or little social information, which can reduce trust. - VT members rely more on a cognitive than an affective element of trust.	Connaughton & Daly, 2004; Holtbrügge et al., 2011; Jarvenpaa & Leidner, 1999; Kanawattanachai & Yoo, 2002; Kirkman et al., 2002; McDonough et al., 2001; Oertig & Buergi, 2006; Peters & Karren, 2009; Pinjani & Palvia, 2013
	Understanding cultural differences	- VT members hold unhealthy racial and national stereotypes. - VT members share little social information due to cultural differences. - VT engages conflict due to in-group/out-group dynamics.	Anawati & Craig, 2006; Au & Marks, 2012; Fain & Kline, 2013; McDonough et al., 2001; Mortensen & Hinds, 2001; Newell et al., 2007; Berg, 2012; Chiu & Staples, 2013; Gibson & Gibbs, 2006; Panteli & Davison , 2005; Polzer et al., 2006

Table 4
Continued

VT Processes	Process Factors	Virtual Team Challenges	References
Cognitive process	Decision making	-VT impairs decision process quality. -When VTs follow a collaborative conflict management style, the performance of the team seems to improve regarding decision process satisfaction, perceived decision quality, and degree of group agreement.	Chiu & Staples, 2013; Paul et al., 2004
	Intercultural learning	-VT results in intercultural misunderstandings. -VT members bring conflicts due to communication style differences. -VT impairs decision quality.	Anawati & Craig, 2006; Fain & Kline, 2013; Gibson & Gibbs, 2006; Glikson & Erez, 2013; Hardin et al., 2007; Holtbrügge et al., 2011; Jarvenpaa & Keating, 2011; Mockaitis et al., 2012; Monalisa et al., 2008; Mortensen & Hinds, 2001; Paul et al., 2005; Shachaf, 2008; Umans, 2008

Table 4
Continued

VT Processes	Process Factors	Virtual Team Challenges	References
Cognitive process	Knowledge sharing	-VT faces difficulties in keeping project goals stable. - VT members hinder information flow due to in-group/out-group perceptions and cultural differences. - VT causes uneven distribution of information due to differences in the salience of information among members and relative differences in speed of access to information.	Cramton, 2001; Gibson & Gibbs, 2006; Newell et al., 2007; Pinjani & Palvia, 2013; Robey, Khoo, & Powers, 2000; Umans, 2008

For the purpose of this study, process factors were selected based on the importance and frequency that most scholars have reported. Based on Valentine et al.'s (2015) review of team survey instruments and other scholarly papers including Han and Beyerlein's (2016) work, the most commonly assessed dimensions of teamwork processes were identified.

Team Outcomes

Lastly, the final variable for this study is team outcomes. Team output refers to team outcomes associated with productivity, as well as the capability of team members to continue working cooperatively. Team outcomes refer to the products of a team's process (Hackman & Wageman, 2005). In early I–P–O models of team effectiveness, it

was implied that team outcomes had a final end state. Although Hackman and Morris (1975) stated that the relation of input–process–output might be circular, subsequent research has only rarely taken into account its iterative characteristic. However, teams develop over time, so recent models have recognized the importance of feedback loops from outcomes to inputs and processes. Thus, at a given time, team performance is an output while possibly also becoming an input and part of the process of a subsequent performance. Therefore, outcomes are not only an output but also serve as input for future processes and can indirectly influence other parts (e.g. Day et al., 2004; Ilgen, 1999; Ilgen et al., 2005; Marks et al., 2001).

Team Performance

Because it is widely understood that improving team process factors can increase team performance, this study focuses on the relationships between team input variables and various process factors to team outcomes as mentioned in the previous section. Team level outcomes can be measured from various sources including self-rating, peer-rating, or someone who appraises the team performance. However, in this study, self-rating of team performance and their products was used.

Furthermore, virtual team performance is defined as the quality and effectiveness of execution of virtual teams in performing the tasks (Liu et al., 2009). An ultimate goal of a class project in higher education is to enhance students' learning or knowledge, skills, and ability in order for them to succeed in a future career. To be competitive in the workplace, students may have to learn how to collaborate in teams even in a virtual environment.

Team Creativity

Many universities increasingly use new types of collaborative tools to promote team-based learning for both online and offline classes. Collaboration helps to solve complex problems by sharing different perspectives when students work on a team project (Han et al., 2016). However, there seems to have been little attention to the study of ways the students create an effective team environment for their work together where collaboration enables creativity. This study used team creativity as one of the team outcome variables.

Team creativity is essential when members collaborate to generate new ideas by synthesizing different ideas and values (Campbell, 1960). While there are many studies on team creativity, very few researchers have examined the effects of team contextual factors on team creativity (Shin, Kim, Lee, & Bian, 2012). This is a critical omission from a theoretical standpoint because team creativity requires several conditions that enable contributions from all members to be crafted into joint solutions, such as working in a psychologically safe environment and having shared empowerment among team members.

Research on team creativity has grown gradually because of the increasing reliance on project-based teams to produce creative outcomes, and researchers have begun to study how team creativity can be enhanced (Joo, Song, Lim, & Yoon, 2012). Research on team creativity has demonstrated both positive and negative aspects. If a task is routine and does not require creative solutions to complex problems, use of a team is a waste of resources. Drawbacks of group creative processes include social

loafing and production blocking (Mullen, Johnson, & Salas, 1991). Nominal groups without interpersonal contact seem to produce nearly double the quantity of novel ideas during brainstorming than interacting groups by avoiding production blocking where the opportunity to share is limited by how many can speak at once (Kerr & Tindale, 2004).

On the other hand, when creative solutions are required in complex situations, a team approach is useful because of the need for an integration of perspectives and ideas. Especially, team creativity researchers suggest that team members who feel psychologically safe may contribute unique expertise and insights, so they jointly craft inputs into useful and original solutions (West, 2002). Learning from each other enhances creativity through sharing relevant information and ideas in a timely manner.

Even if team creativity has recently started to receive a fair amount of research attention, relatively little about creativity in virtual teams has been discovered (Gilson, Maynard, Young, Vartiainen & Hakonen, 2015). Virtual team creativity has been theorized and empirically studied with different outcomes compared to face-to-face team creativity. For example, virtual teams allow team members to contribute ideas and suggestions with less fear of repercussion (Gilson et al., 2015; Ocker, 2005). On the other hand, inhibitors for team creativity include the dominance of some team members, lack of shared understanding, lack of norm setting, and technical difficulties (Ocker, 2005).

The terms teamwork processes and team outcomes refer to interdependent team activities to pursue team's goals. Teamwork processes are the vehicles that transform

team inputs to outcomes. To avoid construct confusion and to sharpen the conception of team process, it is necessary to recognize the distinctions among teamwork process factors to draw a bigger picture of the whole processes.

Hypothesized Research Model

Each team process can help team members enhance team performance and creativity by practicing shared leader responsibilities in a psychologically safe environment. Team members need to pay attention to team processes and deliberately monitor the development of task-related and socio-emotional processes. Figure 2 in *Chapter I* was presented to depict the hypothesized relationships in the research model.

This study examined if team process factors play a role when considering shared leadership and a psychologically safe environment on team performance and creativity. It is assumed that the aforementioned team enablers can impact socio-emotional processes and task-oriented processes. In this section, each hypothesis will be discussed based on support from existing literature as each hypothesis is focused on the logic behind the relationships.

The relationship of team enabler factors with team process factors

Psychological safety facilitates team processes and learning by means of creating an environment in which team members are willing to think critically and express their inner ideas openly without the fear of sanction or punishment, thus, encouraging the challenge of existing knowledge (Carmeli & Gittell, 2009; Hülsheger, Anderson, & Salgado, 2009). Bradley et al. (2012) reported in their study that a psychologically safe environment facilitated team performance, which was benefited

from task conflicts in teams. In contrast, at low levels of psychological safety, team members would feel hesitant to contribute new ideas and contemplate novel approaches (Gilson & Shalley, 2004). Therefore, it is important to have a psychologically safe environment to enable effective team processes.

Creating a psychologically safe communication climate is important when working with team members (Gibson & Gibbs, 2006). As one of the team process factors, trust has been cited as one of the strongest influences on interpersonal team processes and team performance (Carte et al., 2006). Trust is defined as a team's belief that team members will put in efforts to commit and be honest to each other during the processes (Cummings & Bromiley, 1996). Trust is another way of describing willingness to be vulnerable, and psychological safety enables vulnerability that supports risk taking leading to learning and creativity (Bradley et al., 2012; Edmondson, 2008; Edmondson, Kramer, & Cook, 2004; Madjar & Ortiz-Walters, 2009). Even if psychological safety and trust share some overlaps, psychological safety is conceptually different from trust because it focuses on how group members perceive group norm while trust is about how one person views another (Newman, Donohue, & Eva, 2017). Therefore, it is found that in a safe team environment, members build trust as the team develops and produces (Roussin, 2008).

Both face-to-face researchers (De Jong, Dirks, & Gillespie, 2016) and virtual team researchers emphasized trust as the cornerstone of effective teaming (Breuer, Hüffmeier, & Hertel, 2016). However, few researchers explored the relationship between psychological safety and trust in a virtual team setting. One virtual team study

found that the level of trust had a positive impact on the intention to share knowledge through the mediating role of psychological safety (Zhang, Fang, Wei, & Chen, 2010). Therefore, examining the direct relationship between psychological safety and trust in a virtual team setting is necessary, so the following hypothesis was suggested:

Hypothesis 1.1: Psychological safety among team members will correlate positively and significantly with team trust in virtual teams.

In a leaderless group, shared leadership emerges as an evolving "mutual influence process" (Pearce, 2004, p. 48) "relationally produced, emerging through interactions and communication between actors in a context" (Denis et al., 2012, p. 49). Distinct from hierarchical leadership, shared leadership is more vertical rather than upward or downward that enhances team performance in both face-to-face and virtual team settings (Al-Ani, Horspool, & Bligh, 2011; Carte, Chidambaram, & Becker, 2006; D'Innocenzo et al., 2014). Therefore, in addition to a psychologically safe environment, shared leadership is another important team enabler in facilitating team processes.

Shared leadership can affect team process factors, which can be categorized into two levels: (a) social-emotional processes and (b) task-oriented processes. An existing literature review also suggested a theoretical model that supports the effects of shared leadership on team processes and performance (Ensley, Pearson, & Pearce, 2003). The social-emotional process includes trust in the team and shared identity

(Kukenberger et al., 2012; Valentine et al., 2015). On the other hand, the task-oriented processes include effort exerted, quantity and quality of task-related communication, task coordination (Rico et al., 2008), and goal commitment (Kukenberger et al., 2012).

In addition, shared leadership can be categorized into two types of leadership: (a) Task-oriented shared leadership (TOSL) and (b) Relation-oriented shared leadership (ROSL). Specifically, TOSL in teams refer to the activities orchestrating the sequence and timing of interdependent work, such as organizing work, assigning work to team members, and explaining rules and standard procedures (Yukl, 2006; Zalesny et al., 1995). According to McGrath (1990), the task-oriented mechanisms include scheduling deadlines and coordinating pace of effort. TOSL requires team members' communication to "articulate plans, define responsibilities, negotiate deadlines, and seek information to undertake tasks" (Rico et al., 2008, p. 165).

In team settings, TOSL may facilitate task-related processes, such as team goal commitment. Goal commitment indicates that team members feel an attachment to the team goals, and they are determined to achieve the goals (Aubé and Rousseau, 2005). Committed teams tend to devote their cognitive and behavioral resources to achieving the goals (Aubé and Rousseau, 2005). Commitment to team goals is generally understood in expectancy–value framework (Weldon & Weingart, 1993). Specifically, commitment is a function of the expectancy that goal attainment is possible and the value placed on reaching the team goals. Conceptually, members who are highly committed to a goal direct their cognitive and behavioral resources toward attaining the goal, whereas members with low-goal commitment may be distracted from the

assigned goal and may put efforts into unrelated activities because they have not internalized the goal (Renn, 2003). Likewise, face-to-face team researchers found that TOSL activities are closely related to team's goal commitment as TOSL may enhance members' motivation to exert greater efforts in work-oriented activities in face-to-face teams (Kukenberger et al., 2012).

A number of scholars assumed that a virtual team can be successful when task-oriented shared leadership occurs by coordinating tasks and controlling the pace of work (Bell & Kozlowski, 2002; Malhotra et al., 2007; Wageman, 2001; Yoo & Alavi, 2004) and monitoring performance outcomes (Cascio, 2000). TOSL behaviors can have a positive impact on virtual team communication by sending an e-mail asking team members to take responsibilities for different tasks (Wageman, 2001). These behaviors can enhance members' work motivation and goal commitment (Brake, 2006). Leaders can also provide members with valued feedback (Brake, 2006) to increase members' willingness to exert effort in tasks. Also, during virtual team conferences, TOSL can encourage team members to set a goal and periodically report their work status to everyone else in the team (Wageman, 2001). Therefore, the following hypothesis is suggested:

Hypothesis 1.2: Task-oriented shared leadership (TOSL) will correlate positively and significantly with team goal commitment in virtual teams.

Shared leadership can influence shared identity in teams, especially because relation-oriented shared leadership (ROSL) helps team members exchange social/personal information with each other (Zaccaro & Bader, 2003). Mathieu, Kukenberger, D'Innocenzo, and Reilly (2015) used empirical student team data to examine the influence of shared leadership on team dynamics. They found that cohesion—a similar concept to shared identity in this study—and performance were related positively over time, however, shared leadership related positively to team cohesion but not directly to performance. Likewise, in face-to-face teams, ROSL has been seen as an effective leadership style that promoted greater cohesion and shared identity among group members (Tabernero, Chambel, Curral, & Arana, 2009).

Shared identity is described as one of the subsets of socio-emotional processes. Shared identity refers to a strong sense of belonging to the team, which motivates team members to collaborate effectively (Mortensen & Hinds, 2001; Jans et al., 2011). There is a tendency for in-group members who share social identity to be more trusting, respected, and influential than outgroup members, who do not share identity (Postmes, 2003). When supporting and advising behaviors are performed among team members, members may not only enhance their trust, but also build shared identity (Avolio, Sosik, Kahai, & Baker, 2014; Glikson & Erez, 2013).

Few researchers examined the effects of shared leadership on shared identity in virtual teams. Brandon and Pratt (1999) suggested that virtual team leaders should encourage virtual team members to develop shared leadership by addressing similarities, such as educational backgrounds, shared goals, interdependence, and

shared fate. They also suggested that virtual team members develop symbols to represent their team (e.g., a name, logo, shared group database, norms, and procedures, etc.). In addition, scholars have emphasized the importance of encouraging the development of shared identity in virtual teams by providing several strategies (Hinds & Weisband, 2003). Virtual teams that have a strong sense of shared identity tend to be supportive of other team members (Spears & Lea, 1992). For example, high shared identity leads to less emotional conflict and more satisfaction, which results in coordination and trust (Spears & Lea, 1992). Even though there is lacking literature, it is assumed that ROSL may lead to effective communication, which reduces conflict in virtual teams because spontaneous communication is associated with a strong shared identity and more shared context (Hinds & Mortensen, 2005; Mortensen & Hinds, 2001). Therefore, aforementioned findings support the hypothesis below:

Hypothesis 1.3: Relation-oriented shared leadership (ROSL) will correlate positively and significantly with shared identity in virtual teams.

In regards to trust, some researchers have indicated that shared leadership can help team members to build trust in both face-to-face and virtual team settings (Al-Ani et al., 2011). Specifically, ROSL can enhance trust when communicating virtually (Malhotra et al., 2007). ROSL can increase a virtual team's trust by frequent communication through e-mails (Griffith, Sawyer, & Neale, 2003). Exchanging

personal information in an email or chatting with members on their family events can be helpful to enhance trust and social-emotional bonds (Zaccaro & Bader, 2003).

In addition, a unique type of trust called "swift trust" may be formed (Jarvenpaa & Leidner, 1999; Robert, Denis, & Hung, 2009) in a virtual team, and the assumption is that interpersonal dimensions are not required in building swift trust. In this case, ROSL and immediate feedback may help develop swift trust, which allows members to collaborate and trust each other's ability. Therefore, it is important to examine the effects of shared leadership on team trust:

Hypothesis 1.4: ROSL will correlate positively and significantly with team trust in virtual teams.

The relationship of team goal commitment, shared identity, and trust with team performance and creativity

Prior researchers indicated that the quality of collaboration has a positive impact on creativity and team performance (Hoegl & Gemuenden, 2001; DeCusatis, 2008; Madjar & Ortiz-Walters, 2009). The quality of collaboration may link to the quality of team process factors, such as goal commitment, trust, and shared identity. Therefore, it is necessary to explore the relationships between team process factors and team performance and creativity.

Teams with strong beliefs about their abilities can achieve higher performance levels since they put more effort toward the task (Gully et al., 2002). Some researchers

have indicated that goal commitment at the individual level may be associated with work-related processes and outcomes (e.g., Klein & Kim, 1998; Renn, 2003). At the team level, team goal commitment may have positive impacts on team performance (e.g., Hecht, Allen, Klammer, & Kelly, 2002; Hyatt & Ruddy, 1997). Even if the development of team processes may be challenging as they lack time for team building and interactions, the current literature supports the positive influence that team goal commitment may have on team performance (e.g., Fisher et al., 2012; Hecht et al., 2002; LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). Scholars found that team goal commitment and team performance have a significantly positive relationship (Aubé et al., 2014). Even though the relationship between goal commitment and team performance in a virtual team setting has not been explored intensively, Hertel, Konradt, and Orlikowski (2004) found the positive relationship between quality of goal setting processes and the effectiveness of the teams. Therefore, it is hypothesized that:

Hypothesis 2.1: Team goal commitment will correlate positively and significantly with team performance in virtual teams.

Shared identity can enhance team performance because teams with strong beliefs about their abilities can achieve higher performance levels since they put more effort toward the task (Gully, Incalcaterra, Joshi, & Beaubien, 2002). Shared identity is essential to effective communication and increased team performance (Greenaway, Wright, Willingham, Reynolds, & Haslam, 2015). There is not a lot of evidence of the

effect of shared identity in teams. However, shared identity is connected to group cohesion (Zanin et al., 2016). The relationship between group cohesion and team performance has been explored in many empirical studies (Chang & Bordia, 2001; Paul et al., 2016; Mach, Dolan, & Tzafrir, 2010; Mathieu, Kukenberger, D'Innocenzo, & Reilly, 2015), and the different dimensions of group cohesion (e.g., social cohesion and task cohesion) were explored (Chang & Bordia, 2001). Mathieu et al. (2015) conducted a meta-analysis to support that team cohesion and performance are related reciprocally with each other over time. They followed up with empirical student team data to examine the influence of shared leadership on team dynamics and found that cohesion and performance were related positively over time (Mach et al., 2010).

In a virtual team setting, Paul et al. (2016) found that team cohesion promoted project performance. Also, team creativity may be enhanced by social influence and a collaborative team climate (Ocker, 2005). Especially, scholars have found that shared understanding and shared identity may lead to team creativity in a virtual team setting (Ocker, 2005). In other virtual team research, shared team identity was associated with less task conflict in virtual teams, but not in face-to-face teams (Mortensen & Hinds, 2001). However, it is difficult to make a conclusion with these few studies, therefore, it is necessary to understand if shared identity increases team performance and creativity in virtual teams. Thus, it is proposed that:

Hypothesis 2.2: Shared identity will correlate positively and significantly with team performance in virtual teams.

Hypothesis 2.3: Shared identity will correlate positively and significantly with team creativity in virtual teams.

Several researchers have argued that trust may have the strongest influences on team performance (Carte et al., 2006). There are some examples to back up this argument. Madjar and Ortiz-Walters (2009) conducted an empirical study and found that higher levels of trust exhibited a higher level of performance and creativity (Madjar & Ortiz-Walters, 2009). Alexander and Van Knippenberg (2014) indicate that the risk taking and trust among team members increases in importance when radical levels of creativity are required. Tsai, Chi, Grandey, and Fung (2012) found that positive team affective tone was beneficial for team creativity when team trust was low. In higher education, Barczak, Lassk, and Mulki (2010) explored student teams and found team trust and collaborative culture as important antecedents of team creativity.

Virtual team researchers suggest that establishing some form of trust immediately (e.g., swift trust) among team members is essential as a basis for cooperation at the beginning of a project (Crisp & Jarvenpaa, 2013; Robert et al., 2014). Also, Paul, Drake, and Liang (2016) found that individual trust can promote project performance. Liu, Magjuka, and Lee (2008) examined that cognitive thinking style had predictive power over the students' satisfaction with their teamwork experience, as well as the level of trust they exhibited in their team members. This indicates that over time, the virtual team members establish a knowledge-based trust

that is more enduring based on their shared history and accumulating opportunities to observe each other's behaviors (Robert et al., 2009). Not many empirical studies explored the direct relationship between virtual team trust and creativity, except a qualitative study (Han, Chae, Macko, Park, & Beyerlein, 2017). Swift trust in virtual teams also has been the focus of more recent articles, and it is critical to examine how trust is associated with team performance and creativity, therefore, it is proposed that:

Hypothesis 2.4: Team trust will correlate positively and significantly with team performance in virtual teams.

Hypothesis 2.5: Team trust will correlate positively and significantly with team creativity in virtual teams.

Implications for HRD Theory, Research, and Practice

Thus far, the different types of research approaches, underlying theories, and the various researchers and study findings of team process, performance, and its enablers have been presented. This study is important to HRD theory, research, and practice because they help to understand *how*, *when*, and *why* process enablers (e.g., psychological safety and shared leadership) affect team processes and performance. The review of scholarly research and the theoretical foundations provide knowledge and direction to HRD and VHRD scholars and professionals in teamwork. Also, much of the research that has been conducted in this area is based on the psychological theory, one of the foundational theories of HRD (Swanson & Holton, 2001). It is

important for HRD professionals to be familiar with a variety of theories and studies to apply them into practice to improve team process and performance. It would be inappropriate to design the team projects and classes without understanding *how*, *when* and *why* teams can be effective and outperform.

HRD practitioners should explore how important it is to understand the research basis for practices in regards to safe team climate, shared leadership, virtual team learning, development, and team performance. The researchers and practitioners tended to focus on individual levels to understand the mechanism of teams. However, understanding individual performance may not be sufficient for understanding team performance.

The role of HRD and VHRD professionals should include developing methods and process to improve overall team effectiveness and finding challenges associated with team performance (McClernon & Swanson, 1995). Several scholars emphasized the role of instructors in higher education to prepare the teams to use effective team skills, develop lists of characteristics to differentiate high- and low-performance teams, and design team-building interventions to develop successful teams (Han et al., 2016).

Limitations

In this study, the systems theory was used as foundational framework. However, this input-process-output model disregards the direct impact that individuals in the team have on the outcome. As this paper focused on the understanding of team-level dynamics and their effects on team processes, it may be difficult to find the direct impact from individuals to team outcome and performance.

This study has limitations because group synergy was not considered in the model. Hackman (1987) introduced another component to this input-process-output model by introducing the concept of group synergy. Synergy results from the members' interactions as they carry out the task. When group synergy is achieved, process losses are minimized and synergistic gains are created (Hackman, 1987). This synergy is present when the performance or outcomes of a group go beyond the capacities of individual members. It may be difficult to measure the group dynamic and group synergy through this study.

Another limitation is that it will be difficult to directly test other possible mediators, such as conflicts (Jehn, Northcraft, & Neale, 1999; Pelled, Eisenhardt, & Xin, 1999) or group reflexivity (Tjosvold, Tang, & West, 2004). There are a variety of team process factors that potentially relate to team performance (Nijstad & Paulus, 2003), but they are viewed here as limitations because it is difficult to test all of the process variables in a single study or a model.

CHAPTER III

METHODOLOGY

This chapter includes descriptions of the study design, and the sample of the study and its demographic characteristics. Then, data collection procedures, the instruments used to collect data, and the techniques and methods used to analyze the data are described.

Introduction

The purpose of this study was to test a correlational team process model linking team enablers and team processes on team outcomes. To examine the relationships among factors, a quantitative approach was used through statistical analyses (EFA, CFA, and SEM) to develop a team process correlational model. First, a series of EFA was conducted with face-to-face team samples so that team process factors can be identified in face-to-face teams. Then, CFA was conducted with virtual team samples to confirm the factor structures that result from the EFA with face-to-face team samples. Finally, structural equation modeling (SEM) was performed to examine the path coefficients among latent variables in virtual teams.

Two separate surveys of graduate and undergraduate students working in project teams at a large Southwestern university were conducted in Spring 2016 and Fall 2016. Students were expected to complete two questionnaires during a semester to measure several dimensions of team enablers, processes, and performance. The questionnaires were used to explore the perceptions on students' project teams. Those

questionnaires included self-ratings of the team processes and effectiveness (Pearce &Sims, 2002).

To understand the relationships among psychological safety, shared leadership, team processes, and team outcomes related to the uses of virtual and face-to-face team assignments in undergraduate and graduate courses, the following research questions guide this inquiry:

1. What are the underlying dimensions of a team process model for student project teams who took face-to-face courses?

2. Do the dimensions of a team process model for student project teams in face-to-face courses apply to teams in online courses?

3. What structural relationships emerge among the predetermined predictors, team process constructs, and team outcome constructs with teams in online courses?

To answer the research questions, nine main hypotheses were developed based on the theoretical framework that incorporates the following theories: Team Learning (Edmondson, 1999; Robey, Khoo, & Powers, 2000), Shared Leadership (Carson, Tesluk, & Marrone, 2007), and System Theory (Hackman, 1987; McGrath, 1964; Saunders, 2000). Each of these theories represents substantial scholarly literature (Beyerlein, Prasad, Cordas, & Brunese, 2015; Han & Beyerlein, 2016). The hypothesized conceptual model was designed to represent the relationship between team enablers and processes and the relationships between team processes and outcomes. For a visual representation of the research model, see Figure 2 in *Chapter I*.

Study Design

Participants were selected from both face-to-face and virtual classes of graduate and undergraduate university programs. A questionnaire was conducted to examine the impact of the team enablers (Psychological Safety and Shared Leadership) and measure changes in students' team process behaviors to determine whether team process constructs predict team performance.

The purpose of this study is to examine individuals' teamwork experience and the impact of the team processes on team performance. The procedures were as follows (See Table 5): students rated psychological safety and shared leadership at the beginning of the semester (Team Enabler Survey) and students rated team processes factors and team performance at the end of the semester (Team Process/Outcome Survey). The reason for assessing team enabler factors, such as Psychological Safety and Shared Leadership, is to understand how the initial environment and early relationships among students are associated with team processes and performance at the end of the semester. The reasons for assessing the members' team processes and performance at the end of the semester are: (a) to provide a team some time to implement what they have learned in the course and (b) to evaluate team's interactions and dynamics during their work.

The role of time by examining team input, processes, and outcomes at different time points in the team's lifecycle is critical to abandon cross-sectional research when testing the mediational hypotheses (Mathieu, DeShon, & Bergh, 2008). Many researchers argue that research should align measurements of predictor, mediator, and

outcome variables with the hypothesized temporal precedence (Mathieu & Taylor, 2007; Maxwell, Cole, Arvey, & Salas, 1991) so when each variable is measured at different time points, consistent with the researcher's proposed causal sequence, the study design becomes stronger. The design of this study helps increase statistical power because the team enabler and processes/outcomes were measured at different time points, which should reduce the effects of common-method variance (Maxwell, Cole, Arvey, & Salas, 1991).

Table 5
Study Design

Groups	Team Enabler Survey Spring 2016 (February 2016)	Team Process/Outcome Survey Spring 2016 (April 2016)	Team Enabler Survey Fall 2016 (September 2016)	Team Process/Outcome Survey Fall 2016 (November 2016)
Virtual teams Face-to-face teams	Students' surveys (Psychological safety and shared leadership)	Students' surveys (Team process questionnaire + team outcomes)	Students' surveys (Psychological safety and shared leadership)	Students' surveys (Team process questionnaire + team outcomes)

Participant Selection

Participants who qualify for inclusion were from undergraduate and graduate students enrolled in courses offered by an educational human resource department (Department of Educational Administration & Human Resource) at a large public Southwestern university in the United States. Instructors and their student project teams were invited to participate in the study on a voluntary basis. To collect student data and recruit classes, all course instructors in the department were invited to

participate, and some volunteered to be a part of the study. Student participants should work as a team and be involved in the final team project. Students were randomly placed into groups.

Sample Description

Both graduate and undergraduate students were the proposed participants for this study. In Table 6, the number of undergraduate and graduate students are shown in each group. For the graduate level, the typical student is generally an older, full-time employee compared to undergraduates who are younger, full-time students. Most of the teams conducted a project lasting from four to ten weeks during the semester involving organizational clients in the profit or not-for-profit sectors. Some of the teams attended class on campus and thus had the opportunity to meet face-to-face, supplementing meetings with electronic communications. Other classes were online with students geographically dispersed. Thus, they worked virtually, relying on electronic communication devices all or most of the time. The approximate targeted sample size for each type of courses (online or face-to-face) is described in Table 6.

Table 6
Approximate Targeted Sample Size for Each Type of Group

Group	Undergraduate Students	Graduate Students	Students Taking Online Course	Students Taking F2F Course
Spring 2016	451	110	271	290
Fall 2016	235	178	268	145
Total	686	288	539	435

Data Collection Procedures

The student teams were recruited via instructors. All instructors in the department received invitations to involve their students in the study (See Appendix C-1). Due to the fact that participation was voluntary, study benefits and incentives were provided to motivated instructors and students. To motivate instructors, the recruitment information sheet was distributed with the following study benefits: (a) students can self-reflect on their teamwork by answering the questionnaires, and (b) building team skills can relate directly to their current or future roles as professionals. To motivate students, the participants were provided with grade incentives and a chance to participate in a drawing for a $25 gift card from Amazon. Student teams with all members completing the questionnaires were entered into a random drawing for the gift.

Data were collected through a series of surveys (see Appendix B). Data collection was utilized to obtain a multifaceted picture of the students' knowledge of team dynamics and their use of that knowledge during the semester. The Team Enabler Survey was taken in Week 4-5, and the Team Process/Outcome Survey was taken at the end of the project in Week 11-12 in Spring 2016 and Fall 2016 for two consecutive semesters. Data on team process enablers and team processes/performance were collected via a self-administered and self-assessed questionnaire from the students. Surveys were completed on-line on a secure university server using the Qualtrics databases (www.qualtrics.com). The students were asked to answer questions in regards to their perceptions of team climate, shared leadership, team processes, and

performance. Course instructors participated fully in the project by arranging their students into teams, implementing the team project, and providing the materials.

The participants in each course are described in Table 7. There were originally 262 and 319 respondents who filled out the Team Enabler Survey (TES) and Team Process/Outcome Survey (TPOS) in Spring 2016, respectively. In Fall 2016, there were 310 and 263 respondents for TES and TPOS, respectively. The number of respondents who answered both TES and TPOS in Spring 2016 was 158, and the number of respondents who answered both TES and TPOS in Fall 2016 was 214. Therefore, the usable sample size included 372 students. All survey materials, responses, and respondents' information were archived in the Qualtrics database and stored on a personally owned laptop computer with password protection.

While the content of the team projects differed by courses offered in the program, the deliverables were clearly specified in a course guide and syllabus. As shown in Table 5, characteristics of classes whose students participated in this study are described.

Table 7
Participating Classes

Course	Online or On-campus	N	Classification	Data Collected
EHRD 203	Online	40	Undergraduate	Spring 2016
EHRD 203	On-campus	35	Undergraduate	Spring 2016
EHRD 203	On-campus	35	Undergraduate	Spring 2016
TCMG 272	On-campus	32	Undergraduate	Spring 2016

Table 7
Continued

Course	Online or On-campus	N	Classification	Data Collected
EHRD 374-500	On-campus	45	Undergraduate	Spring 2016
EHRD 408	Online	45	Undergraduate	Spring 2016
TCMG 412	On-campus	27	Undergraduate	Spring 2016
EHRD 405	Online	95	Undergraduate	Spring 2016
EHRD 481	On-campus	97	Undergraduate	Spring 2016
EHRD 603	Online	27	Graduate	Spring 2016
EHRD 605	On-Campus	10	Graduate	Spring 2016
EHRD 613	Online	32	Graduate	Spring 2016
EHRD 614	Online	32	Graduate	Spring 2016
EHRD 625	On-Campus	9	Graduate	Spring 2016
EHRD 203-501	On-campus	46	Undergraduate	Fall 2016
EHRD 203-502	On-campus	42	Undergraduate	Fall 2016
EHRD 203-598	Online	41	Undergraduate	Fall 2016
TCMG 274-598	Online	26	Undergraduate	Fall 2016
EHRD 405-599	Online	40	Undergraduate	Fall 2016
EHRD 405-500	On-campus	40	Undergraduate	Fall 2016

Table 7
Continued

Course	Online or On-campus	N	Classification	Data Collected
EHRD 613	On-campus	17	Graduate	Fall 2016
EHRD 614	Online	23	Graduate	Fall 2016
EHRD 618	Online	31	Graduate	Fall 2016
EHRD 625	Online	29	Graduate	Fall 2016
EHRD 627	Online	25	Graduate	Fall 2016
EHRD 643	Online	15	Graduate	Fall 2016
EDAD 638-700	Online	17	Graduate	Fall 2016
EDAD 638-701	Online	21	Graduate	Fall 2016

The goal for Spring 2016 and Fall 2016 was to collect data from 100 class teams. Analyses were conducted after collecting the data in each semester. For a detailed data collection timeframe, see Table 8.

Table 8
Timeframe

Timeline	Target	Action point (How will the goal be accomplished?)	Support and Resource (person & materials)	Target completion date
December 2015	IRB approval for this study	Submit the application early December	Proposal summary Survey instruments Recruitment materials	December 15, 2015
January 2016	Recruitment process	Distribute a letter of introduction and information sheet for the faculty of the department Recruit faculty for the involvement	A letter of introduction and information sheet faculty meeting set up	January 15, 2016
February 2016	Online survey questionnaire administration (TES) *launched the survey on 2-8-16 and closed it on 3-4-16	Email a survey link to teams on Feb 17, 2016	Reminder email and thank you email	February 25, 2016
April 2016	Online survey questionnaire administration (TPOS)	Email a survey link to teams.	Reminder email and thank you email Gift cards for participants	April 25, 2016
May 2016	Data management	Archive questionnaire scores from the online system Close the survey	Reminder email	May 16, 2016
May 2016	Analyses of data and discussion of the findings	Analyze data and write down the findings	Software programs	May 30, 2016

Table 8
Continued

Timeline	Target	Action point (How will the goal be accomplished?)	Support and Resource (person & materials)	Target completion date
August 2016	Recruitment process	Distribute a letter of introduction of the study to recruit faculty	Email sent	August 1, 2016
September 2016	First meeting with faculty	Distribute information sheet for the faculty of the department	Introduction and information sheet faculty meeting set up	September 7, 2016
September 2016	Online survey questionnaire administration (TES) *launched the survey on 9-12-16 and closed it on 9-25-16	Email a survey link to teams on September 12, 2016	Reminder email and thank you email	September 12, 2016
November 2016	Online survey questionnaire administration (TPOS) *launched the survey on 11-18-16 and closed it on 12-04-16	Email a survey link to teams.	Reminder email and gift cards for participants	November 17, 2016
December 2016	Data management	Archive questionnaire scores from the online system Close the survey	Thank you email	December 16, 2016
December 2016 – January 2017	Analyses of data and discussion of the findings	Analyze data and write down the findings	Software programs	January 13, 2017

To avoid social desirability bias, the students were informed that their assessments of their team have no impact on their course grade or team project scores. As dependent and independent variables were collected by different methods and at different times, there was little concern for common method bias in this study. The fact that data on the independent variables was collected earlier than data for the dependent variables provided a stronger basis for inferring causality of the relationships that were analyzed.

Instrumentation

Team Enabler Survey was conducted to examine team members' perceptions of psychological safety and shared leadership about one month after the semester began. Next, Team Process/Outcome Survey was conducted to examine team process factors and team outcome factors at the end of the semester. The survey questionnaires consisted of scales representing the variables described above with course and team identifiers.

To assess the underlying factors of team enablers and team process factors, participant perceptions of a team were measured along several variables (See Appendix A): Psychological Safety, Shared Leadership, team process factors, and Team Performance and Creativity. Team members rated their teams' psychological safety, shared leadership, team processes, and outcomes. An individual reflection questionnaire was administrated to the students to measure the students' teaming experiences.

The full set of surveys for student teams is listed in Appendix B. The surveys include: 1) demographic questions, 2) team profile items, and 3) team process instruments, which included several scales, including goal commitment, shared identity, and trust. These questions were derived from several scales with internal consistency reported in the literature. The instruments for student teams included a total of 73 questions (a total of 7 demographic questions; 7 team profile questions, 17 team enabler questions, 35 team process questions, and 7 team outcome questions). Each section of the survey is outlined in Table 9.

Table 9
Survey Instruments

Section	Type of Survey	Measured Factor Content	# of Survey Items
Section I: Background Information	TES	Personal Demographics Last four digits of phone number Team demographics	14 questions
Section II: Input Factors	TES	Team Psychological Safety (Edmondson, 1999) Shared Leadership (Grille & Kauffeld, 2015)	17 questions
Section III: Process Factors	TPOS	Three team process factors (Goal Commitment, Shared Identity, Trust)	24 questions
Section IV: Outcome Factors	TPOS	Team Performance Team Creativity	7 questions

First, the demographic section included seven items to obtain the following information: gender, age, ethnic background, degree, school year, last four digits of phone number, and length of experience in the industry. Team profile items included

questions, such as the name of the course, class type, team size, teamwork frequency, communication tool, and a number of team experiences.

Second, the survey instruments consisted of three sections: (a) team process enablers (Psychological Safety and Shared Leadership), (b) three team process constructs, and (c) Team Performance and Creativity. Questionnaire items were used to assess student perceptions of Shared Leadership (Grille & Kauffeld, 2015) and Psychological Safety (Edmondson, 1999). Edmondson's (1999) Psychological Safety scale was used to assess students' beliefs that their teams had created a secure environment for expressing their opinions.

Based on Valentine et al.'s (2015) review of team survey instruments and other scholarly papers including Han and Beyerlein's (2016) work, the most commonly assessed dimensions and salient items and dimensions for each domain of teamwork processes were identified. Therefore, the scales were adopted to assess team processes broadly into two categories: socio-emotional processes and task-related processes. Each construct has several facets, and socio-emotional construct comprises items pertaining to such teamwork elements as shared identity (Mortensen & Hinds, 2001) and trust (Hakonen, 2010). Task-related processes include goal commitment (Aubé & Rousseau, 2005).

Measuring Psychological Safety

Team psychological safety is defined as the extent to which the team views the social climate as conducive to interpersonal risk (Edmondson, 1999). Psychological safety scale was measured using Edmondson (1999)'s scale to assess student team

members' beliefs that their teams had created a secure environment for expressing their opinions. The purpose of this instrument is designed to assess team psychological safety and team learning behavior. The psychological safety scale in this study was a 7 item, 5-point responses scale. Three items were positively worded and four items were negatively worded. A sample item is "working with members of this team, my unique skills and talents are valued and utilized." The Cronbach's alpha for this scale was .82. The reliability, validity, and factor structure of the measure have been established in Edmondson's (1999) study. The full questionnaire is presented in Appendix A.

Measuring Shared Leadership

Shared leadership is defined as an emergent team property that results from the distribution of leadership influence across team members (Carson, Tesluk, & Marrone, 2007). Shared leadership was assessed using the questionnaire by Grille and Kauffeld (2015). This measure was collected with a 5-point scale with the following responses: (1) *does not apply at all* to (5) *fully applies*. The questionnaire contains a total of 20 items to measure four different aspects of shared leadership behavior: - task-, relation-, change-, and micropolitic-oriented leadership. This scale has demonstrated excellent measurement qualities because confirmatory factor analyses confirmed the theoretically hypothesized model in two independent German samples (Grille & Kauffeld, 2015). For this study, task (5 items) and relation (5 items) oriented leadership dimensions were used because change and micropolitical leadership dimensions were not relevant to a higher education setting. For example, change leadership orientation has items, such as "as a team we help each other to correctly understand current

company events." Micropolitical leadership orientation includes items, such as "we use networks in order to support our team's work." Grille and Kauffeld (2015) reported their limitation as a relation and a change leadership orientation share a particularly large amount of variance. The Cronbach alpha of the scale for task leadership orientation was .81 in Study 1 and .84 in Study 2 and for a relation leadership orientation was .88 in Study 1 and .91 in Study 2 (Grille & Kauffeld, 2015). A sample item of each is "as a team we ensure that everyone knows their tasks" and "we support each other in handling conflicts within the team" as respectively. The full questionnaire is presented in Appendix A.

Measuring Team Goal Commitment

Measuring team members' shared commitment to their shared goals impacts the team's capacity to perform successfully (Kozlowski & Ilgen, 2006). The goal commitment scale was used to measure a team's goal commitment, which explains their motivational team process. Commitment to the team goals was assessed using three items from the measure provided by Aubé and Rousseau (2005). The Cronbach coefficient alpha calculated in this study was .85. Each item is linked to a 5-point scale ranging from *not true at all* (1) to *totally true* (5). The sample item is "we really care about achieving the team's goal." The full questionnaire is presented in Appendix A.

Measuring Shared Identity

Shared identity refers to a strong sense of belonging to the team, which motivates team members to pursue their goals (Mortensen & Hinds, 2001). Shared identity was measured using a subset of the measures identified by Tyler (1999) and

adapted by Mortensen and Hinds (2001). Respondents rated the applicability of 11 items on a 5-point scale ranging from *not at all* (1) to *Very much* (5). The original survey included 12 items, but one item, "I often think about quitting my job.", was deleted because of the context of higher education. The per-respondent mean yielded an individual identity rating and then, the team-level identification measure was obtained by averaging individual responses per team. A reliable ($\alpha = .93$) team-level identification measure was found in Mortensen and Hinds' (2001) study. A sample item is "When someone praises the accomplishments of the team, I feel it is a personal compliment to me." The full questionnaire is presented in Appendix A.

Measuring Trust

Newell and Swan (2000) defined trust with a three-fold typology: commitment (agreement), companionship (personal friendships), and competency trust (ability on task). Thus, all items were modified to assess trust within the team, which reflects integrity, benevolence, and ability dimensions to satisfy different dimensions of trust. (Mayer et al., 1995; Newell & Swan, 2000). Even if some researchers divided trust dimensions into cognitive and affective (Erdem & Ozen, 2003), in this study, trust was measured with a ten-item scale based on measures from Hakonen's (2010) study, which were originally derived from Cummings and Bromiley (1996; e.g., "In my opinion, my team members are reliable") and McAllister (1995; e.g., "My team members approach their job with professionalism and dedication"). Each of these 10 items is measured on a 5-point scale ranging from *strongly disagree* to *strongly agree.*

In Hakonen's (2010) study, the Cronbach's alpha for this scale was .94. The full questionnaire is presented in Appendix A.

Measuring Team Performance

Team performance is the overall performance on the team project, as assessed by each student. To create a measurement for team performance, the three professors worked together to ensure fair and consistent application of the grading rubric. After collecting the instructors' course syllabus and grading rubrics for the final project, the group of the representative instructors synthesized the rubrics and created a unified grading rubric for team project evaluation. To increase inter-rater reliability, the representative group of instructors provided feedback and made improvement on the rubrics before using it. The team performance measures include four dimensions: content, efficiency, excellence, and originality. These measures were modified based on Hinds and Mortensen (2005)'s team performance scales. The five dimensions on their scales are efficiency, quality, technical innovation, adherence to schedule/budget, and work excellence. The Cronbach's coefficient alpha for this scale was .84. The full rubric is presented in Appendix C-2.

Measuring Team Creativity

Individual team members' perceptions about their team's creativity were asked by using the three items on a five-point scale (Kratzer, Leenders, and Van Engelen, 2010), such as, "how would you rate the newness and originality of the solutions your team finds to problems?" Cronbach's alpha for this scale was .86. The full questionnaire is presented in Appendix B.

Categorizing a Course Type

The virtuality was measured by the course type (virtual vs. face-to-face format). In the model of this study, the course type (face-to-face teams versus virtual teams) was used to test the factor model. The course type was coded as 0 = offline teams and 1 = online teams. If a participant was involved in a team in a face-to-face class, 0 was coded, and if a participant was involved in a team in an online class, 1 was coded.

Description of Data Analysis Process

Data collected from the survey was compiled in an Excel spreadsheet and then analyzed using Excel and statistical software. The data was reviewed and screened to ensure all responses are included. IBM-SPSS 24 was used to perform item and scale analyses as well as regression analyses.

Factor analysis was conducted as one of the statistical methods to develop and validate an instrument through exploratory FA (EFA) and confirmatory FA (CFA) for a set of variables (Mertler & Vannatta, 2010). To answer the research questions, a series of exploratory factor analyses (EFA) with basic descriptive statistics was conducted with samples that have taken face-to-face courses, followed by a series of confirmatory factor analyses (CFA) with samples that have taken on-line courses to confirm the factor structures that result from the exploratory procedures. CFA helps examine the validity of the measures for items and confirm hypothetical relations among variables that were established in the previous EFA or a theory (Hair, Black, Babin, & Anderson, 2010). With the combination of EFA and CFA, the fit of the full

factor model in which each item is set to load on the predicted latent variable with more constrained factor models can be examined (Kelloway, 1998).

In CFA, five criteria are typically used to assess the fit of the model to the data: chi-square (χ^2), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), Standardized Root Mean Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA). The χ^2 statistic is used to test the difference between the predicted (i.e., measurement model) and the observed model (i.e., the data). A significant χ^2 statistic indicates that the model does not fit the data. Due to the sensitivity of χ^2 test in a large sample size (Hair et al., 2010; Meyers et al., 2013), the TLI, CFI, SRMR, and RMSEA were used to make a decision on the model fit. The TLI value equal to or greater than .90 represents a good model fit. In general, a CFI with .90 (desirably .95, or above) is indicative of a good model fit, and values between .80 and .89 are considered to be adequate but marginal fit (Meyers et al., 2013; Tabachnick & Fidell, 2007). The SRMR is the standardized average differences between the measurement model and the data and should be equal to or less than .08 (Tabachnick & Fidell, 2007). The RMSEA is the average of the residuals between the observed covariance in the data and the predicted model. RMSEA of .08 or below (Meyers et al., 2013) is considered an indication of good fit. Maximum Likelihood (ML) estimation was applied to all analyses.

In addition, a structural equation modeling (SEM) analysis was performed because the current research examines the structural relationships among the predetermined predictors and team performance variable. SEM is a multivariate data

analysis technique to determine if a series of theoretical relationships are simultaneously supported by the data (Hair et al., 2010). SEM is different from a path analysis because SEM is used to analyze relationships among latent variables and manifest variables (Meyers et al., 2013). To test the study hypotheses, SEM with the Maximum Likelihood (ML) estimation was used. SEM analyses described by Anderson and Gerbing (1988) were conducted using Mplus 7.3 (Muthen & Muthen, 1998-2010) because the model contained both latent and manifest variables. In other words, hypotheses were tested using the structural relationships among the conceptually independent and dependent variables.

SEM helps verify the hypothesized model and assess how well the hypothesized model represents the relationships found in the data (Meyers et al., 2013). Several steps should be conducted to achieve the above-mentioned purpose. First, model specification is needed to set hypotheses in the structural equation model using exogenous variables (not explained by other variables in the model) and endogenous variables (explained by other variables in the model) (Kline, 2011). To identify the SEM, the model degrees of freedom should be at least zero, and every latent factor should be assigned in a scale (metrics) that leads to a number of parameters and observations (Kline, 2011).

Next, estimation of the model attempts to find a set of parameters estimates that can minimize the ML estimate, which is a common method to estimate structural path coefficients and model-fitting (Kline, 2011). After the ML estimate, model evaluation (model fit) can be conducted to examine if the hypothesized model is accepted or

rejected through chi-square test and goodness-of-fit index. Chi-square ($\chi 2$) aims to test the fit of the hypothesized model by comparing with the actual or observed data set (Meyers et al., 2013). If the two matrices (the one based on the hypothesized model and the one derived from the actual data) are consistent with one another, then the model is acceptable for explaining the hypothesized relationships as shown by a chi-square value that is nonsignificant meaning there is minimal difference between the observed and computed matrices. The hypothesized model with an acceptable fit should yield a *p*-value that is ≥ 0.05. A non-significant chi-square ($\chi 2$) score ($p > .05$) leads to the acceptance of the hypothesized model (Holbert & Stephenson, 2002), which implies that the hypothesized model can capture the data of the actual or observed data model. If the hypothesized model fits, the pattern coefficients of the observed variables and the structural path coefficients of the latent factors may be examined (Holbert & Stephenson, 2002). If the model does not fit, adjustments can be made to improve the match between the two matrices.

Goodness-of-fit index explains the size of misfit (Kline, 2011). Two types of goodness-of-fit indices include Root Mean Square Error of Approximation (RMSEA) and Comparative Fit Index (CFI). RMSEA is scaled as a badness-of-fit index where a value of zero indicates the best fit (Kline, 2011). It represents the difference between each cell in the observed matrix and the computed matrix where a zero would mean perfect match. The cut-off values of RMSEA are 0.05 or less ($\leq .05$) indicating good fit, and 0.08 or less ($\leq .08$) indicates fair fit of the hypothesized model to the actual data (Hu & Bentler, 1999). CFI measures the relative improvement in the fit of a

hypothesized model over that of a baseline or null model (Kline, 2011). The CFI index ranges between 0 and 1, with values near 1 indicating a better fit. CFI with a good fit is greater than .90 (> .90; Hu & Bentler, 1999).

Validity and Reliability

In this study, different assessment methods were used to gauge the team process and performance. The perceptual scores for these items were obtained at the individual level. Survey items were written to capture not individual attributes but attributes of the team as a whole.

To test the validity and reliability, a panel of the three team research experts verified the contents of the constructs (two enablers and four processes). In addition, in terms of a team performance measure, the panel of three instructors reviewed the evaluation rubrics for team projects.

Reliability refers to the extent to which a variable or set of variables is consistent in what it is intended to measure (Hair et al., 2010). Reliability is a required condition for validity. Cronbach's coefficient alpha (α) is the most commonly used reliability coefficient as an index of internal consistency to explain the degree to which respondents respond in a consistent manner to the items in the instrument. General criteria to interpret Cronbach's α are as follows (Meyers et al., 2013): $\alpha \geq .90$ is excellent; $.85 \leq \alpha < .90$ is very good; $.80 \leq \alpha < .85$ is good; $.75 \leq \alpha < .80$ is acceptable; and $.70 \leq \alpha < .75$ is borderline acceptable for research purposes. To examine reliability, Cronbach's α using IBM-SPSS 24 was computed for each instrument and all instruments combined.

Limitations of Research Design

This research has only focused on team-level characteristics and not focused on the individual level characteristics. The complex nature of the team dynamics and synergy effect might have directly impacted the scope of this research. The teams were composed of different people with a various level of KSA, various characteristics, and so on. Based on the diversity of these teams, it is difficult to determine whether or not the current findings will be grounded in any one of these distinguishing traits, or possibly even the interaction between them all.

In this study, a method of aggregation was not used. The survey was used to measure team processes at the individual level, not the team level. A method of aggregation combines lower-level units to reflect a higher-level of analysis, and data are analyzed at the team-level of analysis (Kozlowski & Bell, 2003). However, aggregation has also been criticized for not truly capturing team-level processes because the level of measurement still resides at the individual, not the team level of analysis (Fleenor, Fleenor, & Grossnickle, 1996; Roberts, Hulin, & Rousseau, 1978).

There may be central tendency bias and social desirability bias. This is common for any Likert-type scale. For central tendency bias, participants tend to avoid selecting extreme response categories. Also, under social desirability bias, participants choose responses that show themselves to be more socially favorable.

Summary

In *Chapter III*, an introduction to the research design, and the sample selection was presented. The procedures used for data collection and the instruments used to

collect the data were also explained in detail. In addition, the different types of analyses were presented to test the research hypotheses. The results of the analyses will be discussed in *Chapter IV.*

CHAPTER IV

RESULTS AND FINDINGS

In this chapter, the results from quantitative data analyses are reported, including descriptive statistics, factor analyses (EFA and CFA), SEM, and reliability. IBM-SPSS 24, Mplus 7.3, and Microsoft Excel were used to analyze the data.

The original raw data set was checked for accuracy, missing data, multivariate normality, and univariate normality. For accuracy, the existence of out-of-range values was examined (Meyers et al., 2013). Missing data was also deleted when respondents completed less than half of the survey questions. The final sample size was 372. A series of EFA was run with the sample of 209 face-to-face team students. Then, 163 students, who took online courses, were used when running CFA and SEM, which is an appropriate sample size to run SEM (Muthén, L& Muthén, 2002).

In regards to the assumption of multivariate normality, the variables are expected to be normally distributed (Kline, 2011). To test univariate normality, the skewness and kurtosis was checked using IBM-SPSS 24 (Kline, 2011). The skewness indicates that the shape of a unimodal distribution is asymmetrical about the mean of a variable. The kurtosis indicates the height of the distribution compared with the normal distribution. The range of the kurtosis and skewness between ± 1 is considered an indication of a normal distribution (Meyers et al., 2013), and no extreme skewness or kurtosis were found in any variables.

Descriptive Statistics and Correlation Analysis

Descriptive statistics of 372 valid respondents' demographic characteristics and responses to all of the 59 items in the Team Enabler (17 items), Team Processes (24 items), and Team Outcomes (7 items) were computed using IBM-SPSS 24. Also, the correlations were computed using IBM-SPSS 24.

Demographic Characteristics

In this section, the respondents' demographic variables and characteristics are presented in Table 10, 11, and 12. In Table 10, the respondents' age, gender, and ethnicity were reported. The ages of participants ranged from 18 years of age to 60 years of age, with an average of 24.98 years (SD = 8.316). As shown in Table 10, ethnic demographic characteristics showed that participants were predominately white (N = 227, 61.0%), followed by Hispanic (N = 78, 21.0%), African American (N = 28, 7.5%), Asian (N = 27, 7.3%), Native American (N = 3, 0.8%), and other (N = 9, 2.4%). The number of female respondents (N = 249, 66.9%) was larger than the number of male respondents (N = 123, 33.1%).

Table 10
Demographic Characteristics: Ethnicity and Gender

Variable	Characteristic	Frequency	%	Cumulative %
Ethnicity	White	227	61.0	61.0
	Hispanic	78	21.0	82.0
	African American	28	7.5	89.5
	Asian	27	7.3	96.8
	Native American	3	0.8	97.6
	Other	9	2.4	100.0
	Total	372	100.0	
Gender	Male	123	33.1	33.1
	Female	249	66.9	100.0
	Total	372	100.0	

Individual information in terms of degree, academic classification, and length of individual employment at workplaces was asked. In regard to pursuing degrees, most participants were studying Human Resource Development (N = 242, 65.1%) as seen in Table 11. The distribution of the level of academic classification among participants is illustrated in Table 11, and 125 students (33.6%) were graduate students, and 247 (66.4%) students were undergraduates. In terms of tenure at the practice, 279 of the 372 students had worked in organizations for 5 years or less (78%), 34 had been at their practice 6 to 10 years (9.1%), 18 had worked in organizations between 11 to 15 years (4.8%), and 34 had worked at the company over 16 years (9.1%).

Table 11
Demographic Characteristics:

Degree, Academic Classification, and Length of Employment at Workplace

Variable	Characteristic	Frequency	%	Cumulative %
Degree	Human Resource Development	242	65.1	65.1
	Technology Management	81	21.8	86.9
	Educational Administration	13	3.5	90.4
	Other	36	9.7	100.0
	Total	372	100.0	
Academic Classification	Freshman	9	2.4	2.4
	Sophomore	55	14.8	17.2
	Junior	106	28.5	45.7
	Senior	77	20.7	66.4
	M.S.	111	29.8	96.2
	Ph.D.	14	3.8	100.0
	Total	372	100.0	
Length of Employment at Workplace	Less than 1 Year	128	34.4	34.4
	1-5 Years	151	40.6	78.0
	6-10 Years	34	9.1	87.1
	11-15 Years	18	4.8	91.9
	More than 16 Years	34	9.1	100.0
	Total	372	100.0	

In Table 12, team information was reported, such as the course type (face-to-face versus online) that team members have taken, team tenure, the number of team members on a team, the frequency of face-to-face meetings with all members, and the frequency of virtual team meetings with all members. As for the course type, 209

respondents took a face-to-face class while working as a team, and 163 respondents took an online course while working together on a team project at a distance at the time of this study. The team size of participants ranged from 3 students to 8 students with an average of 4.58 (SD = 1.356) and a median of 4. As for the length of teamwork, the number of weeks ranged from less than 5 weeks to more than 16 weeks. A majority of teams had to work for 9 to 16 weeks, and the distributions were 9-12 weeks (N = 104, 28.0%) and 6-10 years (N = 112, 30.1%). In addition, students in both face-to-face and online courses held some team meetings. A majority of respondents had regular face-to-face meetings with all members twice a month (N = 67, 18.0%) or once a week (N = 82, 22.0%). On the other hand, a majority of respondents had regular online meetings with all members once a week (N = 91, 24.5%) or a few times a week (N = 98, 26.3%).

Table 12
Team Demographic Characteristics:

Course Types, Team Size, Team Tenure, and Frequency of Face-to-Face and Virtual Team Meetings

Variable	Characteristic	Respondents	%	Cumulative %
Course Types	Face-to-Face Course	209	56.2	56.2
	Online Course	163	43.8	100.4
	Total	372	100.0	
Team Size	3	56	15.1	15.1
	4	185	49.7	64.8
	5	59	15.9	80.6
	6	33	8.9	89.5
	7	9	2.4	91.9
	8	30	8.1	100.0
	Total	372	100.0	

Table 12
Continued

Variable	Characteristic	Respondents	%	Cumulative %
Team Tenure	Less than 5 weeks	74	19.9	19.9
	5 to 8 weeks	76	20.4	40.3
	9 to 12 weeks	104	28.0	68.3
	13 to 16 weeks	112	30.1	98.4
	More than 16 weeks	6	1.6	100.0
	Total	372	100.0	
Frequency of face-to-face meeting with all members	Never, not applicable	134	36.0	36.0
	Less than once a month	12	3.2	39.2
	Once a month	16	4.3	43.5
	Twice a month	67	18.0	61.5
	Once a week	82	22.0	83.5
	A few times a week	49	13.2	96.7
	Daily	12	3.2	100.00
	Total	372	100.0	
Frequency of virtual team meeting with all members	Never, not applicable	77	20.7	20.7
	Less than once a month	27	7.3	28.0
	Once a month	15	4.0	32.0
	Twice a month	37	9.9	41.9
	Once a week	91	24.5	66.4
	A few times a week	98	26.3	92.7
	Daily	27	7.3	100.0
	Total	372	100.0	

Descriptive Statistics

The means and standard deviations are presented in Table 13, 14, and 15. The normality assumption (i.e., skewness < 2, kurtosis < 7; West et al., 1995) was well satisfied. Descriptive statistics for the 48 survey items are listed in three tables: Team Enabler Domain (two factors and 17 items) in Table 13, Team Process Domain (three factors and 24 items) in Table 14, and Team Outcome Domain (two factors and seven

items) in Table 15. Using IBM-SPSS 24, the sample size, the means, and the standard deviations (SD) along with minimum (Min) and maximum (Max) item scores are reported in each table. Reversed scored items were marked as 'Reversed' in each table.

Table 13
Descriptive Statistics for Team Enabler Domain

Factor	Item	N	Min	Max	Mean	SD
Psychological Safety	PS1 (Reversed)	372	1	5	2.01	0.952
	PS2	372	1	5	3.78	0.799
	PS3 (Reversed)	372	1	5	1.63	0.838
	PS4	372	1	5	3.78	0.822
	PS5 (Reversed)	372	1	5	1.91	0.996
	PS6	372	1	5	3.85	1.111
	PS7	372	1	5	3.96	0.793
Shared Leadership	TOSL1	372	1	5	3.74	0.861
	TOSL2	372	1	5	3.88	0.830
	TOSL3	372	1	5	4.03	0.680
	TOSL4	372	1	5	3.93	0.796
	TOSL5	372	1	5	3.84	0.856
	ROSL1	372	1	5	3.84	0.838
	ROSL2	372	1	5	4.07	0.703
	ROSL3	372	1	5	4.03	0.763
	ROSL4	372	1	5	3.89	0.764
	ROSL5	372	1	5	3.81	0.837

Table 14
Descriptive Statistics for Team Process Domain

Factor	Item	N	Min	Max	Mean	SD
Trust	Trust1	372	1	5	4.08	0.723
	Trust2	372	1	5	4.02	0.834
	Trust3	372	1	5	4.02	0.908
	Trust4	372	1	5	4.10	0.767
	Trust5	372	1	5	4.08	0.805
	Trust6	372	1	5	4.09	0.807
	Trust7	372	1	5	4.12	0.739
	Trust8	372	1	5	4.05	0.861
	Trust9	372	1	5	4.09	0.868
	Trust10	372	1	5	3.93	1.007
Shared Identity	Sharedid1	372	1	5	4.20	0.891
	Sharedid2	372	1	5	4.33	0.788
	Sharedid3	372	1	5	4.19	0.899
	Sharedid4	372	1	5	4.11	0.991
	Sharedid5	372	1	5	4.17	0.867
	Sharedid6	372	1	5	3.89	1.059
	Sharedid7	372	1	5	3.90	1.016
	Sharedid8	372	1	5	3.73	1.088
	Sharedid9	372	1	5	3.98	0.956
	Sharedid10	372	1	5	3.96	0.916
	Sharedid11	372	1	5	4.12	0.840
Goal Commitment	Goal1	372	1	5	4.43	0.807
	Goal2	372	1	5	4.54	0.727
	Goal3	372	1	5	4.49	0.803

Table 15
Descriptive Statistics for Team Outcome Domain

Factor	Item	N	Min	Max	Mean	SD
Team Performance	TP1	372	1	5	4.17	0.778
	TP2	372	1	5	4.10	0.869
	TP3	372	1	5	4.17	0.818
	TP4	372	1	5	4.11	0.835
Creativity	Creativity1	372	1	5	3.81	0.811
	Creativity2	372	1	5	3.80	0.841
	Creativity3	372	1	5	3.78	0.829

Result of Correlation Analysis

As shown in Table 16, all of the correlations were statistically and positively significant ($p < .01$). According to the result of a bivariate correlation analysis, all of the correlation coefficients were significant.

Table 16
Bivariate Correlation Matrix

	PS	TOSL	ROSL	TR	SI	GC	TP	CRE
PS	1	.523**	.623**	.369**	.367**	.278**	.279**	.279**
TOSL	.523**	1	.723**	.405**	.393**	.280**	.289**	.341**
ROSL	.623**	.723**	1	.453**	.419**	.312**	.296**	.359**
TR	.369**	.405**	.453**	1	.786**	.610**	.702**	.662**
SI	.367**	.393**	.419**	.786**	1	.654**	.748**	.684**
GC	.278**	.280**	.312**	.610**	.654**	1	.666**	.481**
TP	.279**	.289**	.296**	.702**	.748**	.666**	1	.636**
CRE	.279**	.341**	.359**	.662**	.684**	.481**	.636**	1

Note. ** $p < .01$ (Two-tailed). N = 372. PS = Psychological Safety; TOSL = Task-oriented Shared Leadership; ROSL = Relation-oriented Shared Leadership; TR = Trust; SI = Shared Identity; GC = Goal Commitment; TP = Team Performance; CRE = Creativity.

Results of Reliability Analysis

Reliabilities were estimated for the eight latent variables (Psychological Safety (PS), Task-oriented Shared Leadership (TOSL), Relation-oriented Shared Leadership (ROSL) in Team Enabler Domain; Goal Commitment, Shared Identity, and Trust in Team Process Domain; and Team Performance and Creativity in Team Outcome Domain) that were established with combined sample of face-to-face teams and virtual teams. IBM-SPSS 24 was used to obtain the reliabilities (Cronbach's α, coefficient of internal consistency), which are presented in Table 17.

Table 17
Estimates of Reliability

Scale	Factor	N of Items	Cronbach's α
Team Enabler Domain	Psychological Safety (PS)	7	.731
	Task-oriented Shared Leadership (TOSL)	5	.878
	Relation-oriented Shared Leadership (ROSL)	5	.872
Team Process Domain	Trust (TR)	10	.954
	Shared Identity (SI)	10	.946
	Goal Commitment (GC)	3	.900
Team Outcome Domain	Team Performance (TP)	4	.910
	Team Creativity (CRE)	3	.902

Note. N=372.

According to the general criteria to interpret the Cronbach's α (Meyers et al., 2013), six reliabilities were excellent ($\alpha \geq .90$), and three were very good ($.85 \leq \alpha < .90$) for research purposes. In particular, all factors in the research model (Figure 4 in *Chapter IV*) had either good or very good reliabilities ranging from .872 to .954, except Psychological Safety (Cronbach's $\alpha = .731$).

Results of Factor Analyses

To answer the three research questions, a series of exploratory factor analyses (EFA) was conducted in face-to-face teams, followed by a series of confirmatory factor analyses (CFA) in virtual teams to confirm the factor structures that result from the exploratory procedures. Then, SEM was conducted to examine the path coefficients among latent variables. The results of EFA and CFA for the three constructs: Team Enabler, Team Processes, and Team Outcomes were reported. A series of EFA was run with 209 face-to-face team students. Then, CFA were run with 163 virtual team members. Lastly, the same sample of 163 was used to run SEM.

Results of Exploratory Factor Analysis

The Kaiser-Meyer-Olkin (KMO)'s measure of sampling adequacy (MSA) test and the Bartlett's Sphericity test were conducted to determine if the sample had met the requirement for a factor analysis (Meyers et al., 2013). For the KMO, the MSA index is used to check sampling adequacy and can be interpreted as follows (Hair et al., 2010): MSA $\geq .80$ is meritorious; $.70 \leq$ MSA $< .80$ is middling; $.60 \leq$ MSA $< .70$ is mediocre; $.50 \leq$ MSA $< .60$ is not good; and MSA $< .50$ is unacceptable. A significant Bartlett's Sphericity value implies that the correlation matrix (See Table 16) of all variables in a scale show significant correlations among at least some of the variables, and thus the variables can be factor analyzed.

When running EFA, the percentage of variance and factor loadings should be examined (Meyer et al., 2013). The percentage of variance criterion refers to the requirement that 60% or more of the total variance can be explained by the extracted

factors. The size of factor loading requires items with factor loadings that are equal to or greater than .40 to be retained in an EFA procedure (Meyers et al., 2013). Also, in order to achieve a pattern of simple structure, cross-loading is not allowed, where an item loads on more than one factor with factor loadings equal to or greater than .40 (Meyers et al., 2013).

According to Osborne and Costello (2009), factors can be extracted by unweighted least squares, generalized least squares, maximum likelihood, principal axis factoring, alpha factoring, and image factoring. They recommended use of maximum likelihood (ML) when data is relatively normally distributed because the computation of a wide range of indexes of the goodness of fit of the model allows statistical significance testing of factor loadings. The EFA was conducted using covariance matrices and Kaiser Normalization of the loadings for Promax because Promax has been shown to yield better results over Varimax, according to previous data that was studied (Dien, Beal, & Berg, 2005). Osborne and Costello (2009) suggested that .32 is acceptable and .50 or higher is strong for factor loadings.

Exploratory factor analysis in face-to-face teams. A series of EFA was run with 209 students, who have taken face-to-face courses. All factors including the Team Enablers (17 items), Team Processes (24 items), and Team Outcomes (7 items) were analyzed in accordance with the a priori hypothesized structure of the scale (Bates et al., 2012). It is hypothesized that Psychological Safety (7 items), ROSL (5 items), and TOSL (5 items) were considered in the domain of team enablers for this study. Trust (10 items), Shared Identity (11 items), and Goal Commitment (3 items) loaded in the

domain of team processes. Team outcomes for this study included Team Performance (4 items) and Creativity (3 items).

In the initial EFA, a total of nine factors with 48 items cumulatively accounted for 61.358% of the total variance. Bartlett's Sphericity test was significant (χ^2 = 7510.830, df = 1128, p = .000), and the MSA index was .928. Every item met the factor loading criterion for extraction, except PS2, PS4, PS6, PS7, ROSL2, and TR8, which had insufficient loading onto a hypothesized factor (less than .40). In addition, ROSL1 was double loaded in TOSL (0.453) and ROSL construct (.500), so ROSL1 was deleted in the second EFA attempt with the same face-to-face team samples.

As demonstrated in Tables 18 and 19, removing ROSL1 produced a simple structure with nine factors, accounting for 61.425% of the variance of the 47 items. Bartlett's Sphericity test was significant (χ^2 = 7336.840, df = 1081, p = .000), and the MSA index (Kaiser-Meyer-Olkin Measure of Sampling Adequacy index) was .928, suggesting that the present data in face-to-face teams can be used for the EFA.

With this revised EFA model as seen in Table 18 and Table 19, Factor 1 accounted for 38.340% of the variance of all items and provided a clear match to the theoretical factor, which is Shared Identity. Factor 2 accounted for 7.071% of the variance, which was Trust, which matched the theoretical factor. Factor 3 accounted for 3.499%, named Task-oriented Shared Leadership (TOSL1, TOSL2, TOSL3, TOSL4, and TOSL5), which matched the theoretical factor.

Table 18
Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	18.353	39.049	39.049	18.020	38.340	38.340	15.357
2	3.719	7.912	46.961	3.323	7.071	45.411	14.484
3	1.993	4.240	51.200	1.645	3.499	48.910	8.272
4	1.763	3.751	54.951	1.377	2.930	51.840	7.675
5	1.672	3.558	58.509	1.365	2.903	54.744	8.685
6	1.423	3.027	61.536	1.023	2.176	56.920	10.466
7	1.216	2.587	64.123	.791	1.683	58.603	7.850
8	1.178	2.506	66.629	.705	1.501	60.104	5.495
9	1.022	2.174	68.803	.621	1.322	61.425	.833
10	.976	2.078	70.881				
11	.965	2.053	72.934				
12	.875	1.862	74.797				
13	.813	1.731	76.527				
14	.764	1.625	78.152				
15	.657	1.398	79.550				
16	.631	1.343	80.893				
17	.587	1.250	82.143				
18	.531	1.130	83.272				
19	.527	1.121	84.394				
20	.500	1.063	85.457				
21	.460	.979	86.436				
22	.456	.969	87.405				

Table 18
Continued

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
23	.431	.917	88.323				
24	.428	.911	89.233				
25	.394	.838	90.072				
26	.384	.817	90.889				
27	.358	.761	91.650				
28	.319	.679	92.330				
29	.310	.660	92.990				
30	.300	.638	93.628				
31	.289	.616	94.244				
32	.282	.601	94.844				
33	.257	.546	95.391				
34	.243	.517	95.908				
35	.213	.453	96.361				
36	.203	.433	96.794				
37	.196	.417	97.210				
38	.182	.387	97.597				
39	.172	.367	97.964				
40	.160	.341	98.304				
41	.145	.309	98.614				
42	.136	.290	98.904				
43	.129	.275	99.179				
44	.115	.245	99.424				
45	.108	.230	99.654				
46	.084	.178	99.832				
47	.079	.168	100.000				

Note. Extraction Method: Principal Axis Factoring.

Table 19
Pattern Matrix

	Factor								
Item	1	2	3	4	5	6	7	8	9
PS1								.543	
PS2									
PS3								.867	
PS4									
PS5								.449	
PS6									
PS7									
ROSL2									
ROSL3							.599		
ROSL4							.893		
ROSL5							.607		
TOSL1			.710						
TOSL2			.939						
TOSL3			.652						
TOSL4			.819						
TOSL5			.694						
Goal1				.645					
Goal2				.906					
Goal3				.763					
Sharedid1	.764								
Sharedid3	.793								
Sharedid4	.897								
Sharedid5	.762								
Sharedid6	.713								
Sharedid7	.453								
Sharedid8	.536								
Sharedid9	.871								
Sharedid10	.565								
Sharedid11	.500								

Table 19
Continued

Item	Factor								
	1	2	3	4	5	6	7	8	9
Trust1		.662							
Trust2		.697							
Trust3		.755							
Trust4		.698							
Trust5		.910							
Trust6		.817							
Trust7		.816							
Trust8									
Trust9		.538							
Trust10		.604							
TP1						.636			
TP2						.719			
TP3						.827			
TP4						.497			
CRE1					.593				
CRE2					.811				
CRE3					.820				

Results of Confirmatory Factor Analysis in Virtual Teams

To evaluate how well the face-to-face team measurement models established in the EFA stage align and fit the virtual team data, a series of CFAs were conducted with the virtual team sample (N = 163). Mplus 7.3 was used to analyze the data. Due to the large sample size, the χ^2 value was estimated, but was not used in assessing the model-data fit (Hair et al., 2010; Kline, 2011; Tabachnick & Fidell, 2007). In the same way as the EFA was conducted, the factors of the Team Enabler, the Team Processes, and

Team Outcome domains were included all at once to test the virtual team measurement model (Bates et al., 2012).

To assess the data model fit, goodness-of-fit indexes were used, such as the Comparative Fit Index (CFI; Bentler, 1990), the Tucker Lewis Index (TLI; Tucker and Lewis, 1973), the Root mean Square Error of Approximation (RMSEA; Steiger and Lind, 1980), and the Standardized Root Mean Square Residual (SRMR). A value of the CFI and TLI of .90 and higher indicates an adequate fit, and a threshold of .08 and lower on the SRMR designates an adequate fit (Hu & Bentler, 1999). A value of the RMSEA of .05 designates good fit, while values near .08 indicate fair fit and those of .10 and higher indicate poor fit (Browne and Cudeck, 1993). Each model of fitness is presented in the next section.

The CFA results using the eight-factor model with 24 items indicated that the face-to-face team measurement model fits the virtual team data fairly well (Hair et al., 2010; Meyers et al., 2013): TLI = .931; CFI = .944; SRMR = .050; and RMSEA was .075 (90% CI: .064– .086). Although the χ^2 test was statistically significant (χ^2 = 428.648, df = 224, $p < .001$), the CFA results of virtual teams revealed that the team process model was a good fit for the data. Most researchers report the χ^2 even if a nonsignificant χ^2 may be unlikely because this statistic tests whether the model is an exact fit to the data. Finding an exact fit is rare (Weston & Gore, 2006).

The three items that loaded highly on each factor were used to represent each latent variable to increase fewer possibilities for residuals to be correlated and cause reductions in various sources of sampling error (MacCallum et al., 1999). According to

the EFA results as seen in Pattern Matrix in Table 19, PS1, PS3, and PS5 represented Psychological Safety; TOSL1, TOSL2, and TOSL4 represented Task-oriented Shared Leadership; and ROSL3, ROSL4, and ROSL5 represented Relation-oriented Shared Leadership for Team Enabler domain. In terms of Team Processes domain, GC1, GC2, and GC3 were chosen to represent Goal Commitment; SI3, SI7, and SI9 were selected for Shared Identity; and TR5, TR6, TR7 were selected for Trust. For Team Outcomes domain, TP1, TP2, and TP3 were chosen to represent Team Performance, and CRE1, CRE2, and CRE3 represented Creativity.

The benefits of choosing three items per each construct are to keep the ratio of manifest indicators to latent constructs manageable, to reduce the number of free parameters in the model to decrease sample size requirements and to increase the chances of adequate model fit (Hall, Snell, Foust, 1999). The standardized factor loadings ($p < .001$) ranged from .645 (PS5) to .934 (TR5), which provide the evidence of convergent validity (Hair et al., 2010). The standardized interfactor correlations ($p < .001$) ranged from .270 (PS with SI) to .899 (ROSL with TOSL), indicating that there were no problems with discriminant validity for the team process CFA model ($\leq .90$, Kline, 2011).

Results of Structural Equation Modeling in Virtual Teams

The above CFA results indicated that PS, ROSL, TOSL, GC, SI, TR, TP, and CRE were underlying latent factors in virtual teams. Based on the measurement model from CFA with virtual team data, SEM was analyzed to investigate the hypothesized models and the structural relationships with the same data. The model involved the

three factors from team enablers (Psychological Safety, ROSL, and TOSL), three team process factors (Goal Commitment, Shared Identity, and Trust) and two team outcome factors (Team Performance and Creativity). The structural model, as shown in Figure 4, was used to assess the relationships among six latent predictors on team performance and team creativity. In Figure 4, the parameters were statistically significant ($p < .01$), and non-significant path coefficients were presented as dotted arrows. Mplus 7.3 was used to obtain all of the standardized (STDYX) parameters and path coefficients.

In this SEM, three items that loaded highly on each factor were used to represent each latent variable. These items were identified via EFA in the previous section. This common method was used to have fewer possibilities for residuals to be correlated or dual loadings to emerge and bring about reductions in various sources of sampling error (MacCallum et al., 1999; Hong, 2012).

To answer the third research question, the final model was tested. To identify if the model is adequate, Comparative Fit Index (CFI; Bentler, 1990), the Tucker Lewis Index (TLI; Tucker and Lewis, 1973), the Root mean Square Error of Approximation (RMSEA; Steiger and Lind, 1980), and the Standardized Root Mean Square Residual (SRMR) were examined. In the first attempt, the χ^2 test was statistically significant ($\chi^2 = 630.251$, $df = 239$, $p < .001$), and the other indices were not within a range that would be associated with good fit: TLI = .876; CFI = .893; SRMR = .205; and RMSEA = .100 (90% CI: .091 – .110) meaning the model did not capture the relationships underlying the covariance in the observed data matrix well. A value of the RMSEA of .10 and higher indicates poor fit, which means the model does not represent the

observed data well (Browne and Cudeck, 1993). A threshold of .08 and lower on the SRMR designates an adequate fit (Hu and Bentler, 1999) meaning the error terms account for only a small part of the variance represented by the correlation matrix, however, the model fit indices for the first attempt suggested that the model is not adequate.

To identify the issue, Modification Indices was used in Mplus to consider minor modifications to the team process model based on the results of analyses. Modification Indices became common practice to modify the model, if the fit of a model is not adequate (Hox & Bechger, 1998). Modification Indices are used to check the need for including correlations among variables to make the data fit well (Muthén, & Asparouhov, 2002). To reduce the value of χ^2 by a statistically significant amount, recommended changes were followed. Any modification of a model should be theoretically justifiable, and modifications should be minor. Modification Indices suggested that three variables in Team Processes domain (Goal Commitment, Shared Identity, and Trust) should be correlated. Adding parameters helped improve the fit. As team researchers (Chow & Chan, 2008; Hertel et al., 2004; Kimble, 2011; Webster, & Wong, 2008) found the high correlations among team process variables, the suggestions from Modification Indices were accepted.

After making the modification by adding parameters of the three latent variables in Team Processes domain, the model fit was improved. Although the χ^2 test was statistically significant ($\chi^2 = 422.301$, df = 236, $p < .001$), the other indices were within a range that would be associated with good fit: TLI = .934; CFI = .943; SRMR

= .060; and RMSEA = .073 (90% CI: .063 – .084). Most researchers report the χ^2 even if a nonsignificant χ^2 may be unlikely (Weston & Gore, 2006). Out of nine parameters, seven of the standardized (STDYX) parameters were statistically significant ($p < .01$). Two parameters (PS to TR and TR to TP) were not statistically significant. The path coefficients ranged from .326 (between ROSL and SI) to .503 (between TR to CRE). The R^2 estimates for each observed variable are presented in Table 20. The correlations between TR with SI was .746; TR with GC was .633; and SI with GC was .640.

As seen in Figure 4, seven hypotheses (H1.2, H1.3, H1.4, H2.1, H2.2, H2.3, and H2.5) were accepted, and two hypotheses (H1.1 and H2.4) were not supported. First, the relationship between Psychological Safety and Trust (H1.1) was not significantly associated ($\gamma = -.021$, $p = .846 > .05$). The path coefficients from TOSL to Goal Commitment (H1.2, $\gamma = .337$), from ROSL to Shared Identity (H1.3, $\gamma = .326$), ROSL to Team Trust (H1.4, $\gamma = .404$) were all positive and significant in SEM ($p < .01$).

H2.1 was supported as team goal commitment correlated positively with team performance in virtual teams ($\gamma = .481$, $p = .01 < .05$). H2.2 was supported as shared identity correlated positively and significantly with team performance in virtual teams ($\gamma = .345$, $p = .01 < .05$). H2.3 was supported as shared identity correlated positively and significantly with team creativity in virtual teams ($\gamma = .351$, $p = .01 < .05$). H2.5 was supported as team trust correlated positively and significantly with team creativity in virtual teams (($\gamma = .503$, $p = .01 < .05$). However, the relationship between Trust and Team Performance (H2.3) was not significantly associated ($\gamma = .110$, $p = .214 > .05$).

Table 20
Squared Multiple Correlations (R2) in the SEM Model

Factor	Observed Variable	R^2	S.E.
Psychological Safety (PS)	PS1	.423	.077
	PS3	.567	.082
	PS5	.423	.079
Task-oriented Shared Leadership (TOSL)	TOSL1	.627	.057
	TOSL2	.695	.052
	TOSL4	.672	.054
Relation-oriented Shared Leadership (ROSL)	ROSL3	.673	.052
	ROSL4	.653	.054
	ROSL5	.623	.056
Goal Commitment (GC)	GC1	.846	.032
	GC2	.862	.031
	GC3	.736	.041
Shared Identity (SI)	SI3	.733	.038
	SI7	.922	.017
	SI9	.938	.015
Trust (TR)	TR5	.870	.027
	TR6	.859	.028
	TR7	.724	.042
Team Performance (TP)	TP1	.860	.028
	TP2	.778	.036
	TP3	.869	.027
Team Creativity (CRE)	CRE1	.769	.039
	CRE2	.810	.035
	CRE3	.840	.033

Note. S.E. = Standard Error. N = 163.

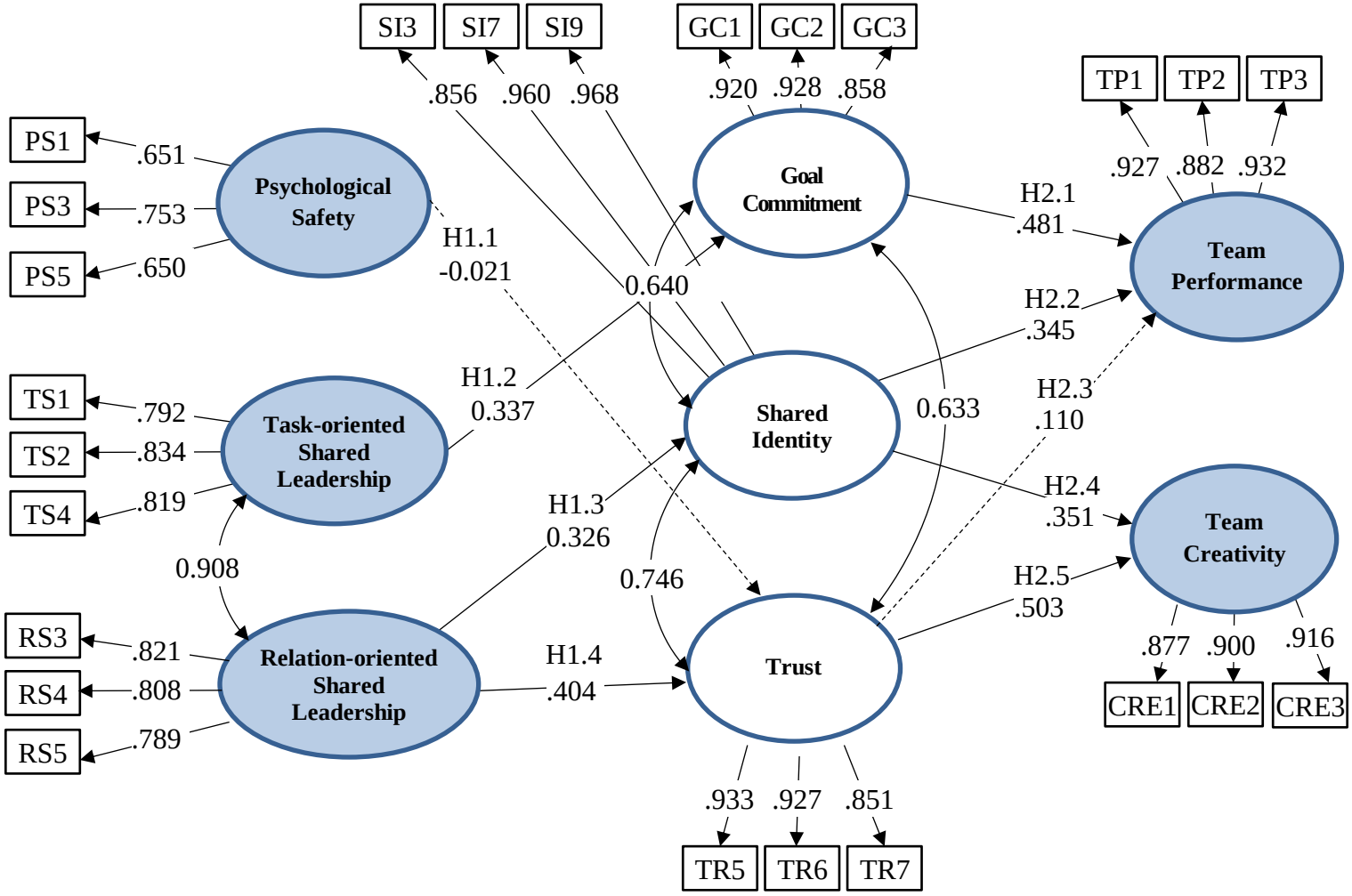

Figure 4. Team process model with virtual teams.

Summary

In *Chapter IV*, the results of the analyses were reported. The quantitative analyses were conducted, and descriptive statistics, correlations, reliability analysis, and inferential statistics from EFA, CFA, and SEM were reported. Prior to the factor analyses, data were checked to examine accuracy, missing data, and multivariate/univariate normality.

The results from EFA in face-to-face teams led to verification of measurement using CFA with virtual teams. The SEM analysis results with virtual teams indicated that the hypothesized empirical model had an acceptable fit by four fit indices. According to Table 21, the hypothesized virtual team model with eight factors had an acceptable fit by four fit indices by correlating the three team process factors. The findings will lead to the discussion, with regard to the research questions and hypotheses, in *Chapter V.*

Table 21
Fit Indices of the SEM models

Fit indices	Initial SEM model	Modified SEM model
Chi-square test	$\chi^2 = 630.251$ (df = 239, $p < .001$)	$\chi^2 = 422.301$ (df = 236, $p < .001$)
CFI (>.90)	.893	.943
TLI (>.90)	.876	.934
SRMR (<.08)	.205	.060
RMSEA (<.08)	.100	.073

CHAPTER V

SUMMARY

This chapter includes three major sections. It starts with a discussion of the research questions and hypotheses (See hypothesized research model with nine hypotheses in Figure 4). Then, the implications for HRD research, practice, and theory are discussed. Finally, the limitations and future recommendations are provided. The three research questions are as follows:

1. What are the underlying dimensions of a team process model for face-to-face student project teams?

2. Do the dimensions of a team process model for face-to-face student project teams apply to virtual student teams?

3. What structural relationships emerge among the predetermined predictors, team process constructs, and team outcome constructs for virtual teams?

Discussions

In this section, the two research questions of the current study are discussed by interpreting and comparing the results with previous research.

Research Question 1: Dimensions of a Team Process Model

The first research question is directed at answering what kinds of dimensions of a team process model for face-to-face student project teams exist. To identify the constructs, a literature review about face-to-face team research was conducted. After selecting the key factors (team enablers, processes, and outcomes) based on theoretical framework, a team process model was created. Having all these factors in one model

was a novel attempt, therefore, a series of EFAs were run to identify factors that shape a team process model using the face-to-face team sample. The first research question was answered by finding eight separate factors: Psychological Safety, Task-oriented Shared Leadership, Relation-oriented Shared Leadership, Goal Commitment, Shared Identity, Trust, Team Performance, and Creativity.

Research Question 2: Validation of Virtual Team Process Measurement

The second research question required validation of a face-to-face team process model and examination of applicability of the face-to-face team process model to virtual teams. To answer this question, a series of CFAs were run with a sample of virtual team members using items that were identified from the EFA. The measurement was considered a good fit, which led to the next step, which was examining the structural relationship of that model.

Research Question 3: Structural Relationships in Virtual Team Process Model

The third research question attempts to examine the structural relationships among Team Enabler, team process factors, Team Performance, and Creativity in virtual teams. In Figure 4, the nine hypotheses were tested using the SEM as the final model. Interpretations and discussions of the results follow.

Hypothesis 1.1-1.4. The effects of team enablers on team processes.

According to Hypothesis 1.1-1.4, the effects of Psychological Safety and two types of shared leadership: TOSL and ROSL on team process factors were expected to have positive structural path coefficients. Based on the empirical data of the current study, Hypothesis 1.2, 1.3, and 1.4 were fully supported. However, the relationship between

Psychological Safety and Trust (H1.1) was not significantly associated (γ = -.021, p = .846 > .05). The path coefficients from TOSL to Goal Commitment (H1.2, γ = .337), from ROSL to Shared Identity (H1.3, γ = .326), ROSL to Team Trust (H1.4, γ = .404) were all positive and significant in SEM ($p < .01$). These results indicate that TOSL and ROSL are strong predictors that may influence team outcome factors. Specifically, it was evident that TOSL is connected to task-oriented process (e.g., goal commitment) whereas ROSL has a high association with socio-emotional processes, such as shared identity and trust.

First, H1.1 was not supported, suggesting that the relationship between Psychological Safety and Trust was not significantly associated in a virtual team setting even if the face-to-face team researchers agree that a psychosocially safe climate (Bradley et al., 2012; Roussin, 2008) has a direct positive effect on team processes and performance. Interpreting this finding seems challenging, however, the relationship between two constructs may depend on the level of virtuality. In other words, the relationship between two constructs may become significant if team members meet more often via visual or auditory conferences compared to using email correspondence (Kratzer et al., 2006), which suggests a further testing. As teams increase in their level of virtuality and become more dependent on technology to interact, face-to-face communication becomes less likely (Scott & Wildman, 2015). Communication breakdowns may occur when teams interact via technology, as media often lacks social cues that help individuals correctly interpret messages and build trust (Fiore, Salas, Cuevas, & Bowers, 2003). Also, the tenure of a team (conducting a team

project for a long time) or the concept of swift trust (Robert et al., 2009) may be other factors that can influence those relationships, which warrant the future research attention.

In this study, shared leadership had a significant effect on team process factors, such as goal commitment (H1.2), shared identity (H1.3), and team trust (H1.4). TOSL was significantly associated with goal commitment in a virtual team setting. For example, executing and monitoring behavior (TOSL) can initiate team members' goal setting behaviors (Wageman, 2001). Members may initiate chats through instant messenger or phone calls to understand their needs. Then, team members can set up personalized work goals and identify procedures to accomplish jobs. In addition, ROSL was significantly related to shared identity and team trust in a virtual team setting. No previous studies mentioned the direct relationships between ROSL and shared identity/trust. This team process model of this study suggests that ROSL may enhance shared identity and trust by communicating virtually (Griffith et al., 2003; Malhotra et al., 2007). Exchanging personal information or chatting with members on their family events can be helpful to enhance trust and social-emotional bonds (Zaccaro & Bader, 2003) even in a virtual world.

Results of this study correspond to previous studies that asserts that shared leadership (D'Innocenzo et al., 2014; Hoch, 2012; Ishikawa, 2012) has a direct positive effect on team processes. However, no scholars in the U.S. seem to have examined both shared leadership and psychological safety in one model or in the same study. One empirical study from China has explored the positive impact of shared leadership on

team learning through the mediating role of team psychological safety among employees (Liu, Hu, Li, Wang, & Lin, 2014). Further research is needed to investigate the relationships among shared leadership, psychological safety, and other team process variables.

Hypothesis 2.1-2.5. The effects of team processes on team outcomes. According to Hypothesis 2, the positive effects of team processes on Team Performance and Creativity should be shown by positive structural path coefficients. Based on the empirical data of the current study, Hypothesis 2 was partially supported because H2.3 was not supported, but other hypotheses (H2.1, H2.2, H2.4, and H2.5) were supported. The relationship between Trust and Team Performance (H2.3) was not significantly associated ($\gamma = .110$, $p = .214 > .05$).

First, H2.1 was supported because team goal commitment correlated positively and significantly with team performance in virtual teams ($\gamma = .481$, $p = .01 < .05$). The results of this finding are supported by results of a field study with 31 virtual teams that goal-related practices correlated with the effectiveness of the teams (Hertel et al., 2004). In the face-to-face team studies, it was found that team goal commitment may have positive impacts on team performance (e.g., Hecht et al., 2002; Hyatt & Ruddy, 1997).

The relationship between goal commitment and team creativity was not examined in this study because the research supports the fact that team members' high goal commitment may not produce high creativity (Amabile & Conti, 1999; Hon & Kim, 2007; Kratzer, Leenders, & Van Engelen, 2004; Shalley, 1991). When team

members commit to a performance goal, they may emphasize accomplishing their routine performance rather than developing innovative or creative actions to improve an outcome. Further research on goal commitment and creativity needs to be done. The effect of goal commitment can be different on team creativity depending on what type of goal orientations and team contexts (e.g., centralization and formalization) team members share (Hirst et al., 2011). Therefore, future researchers need to consider both team contexts and the type of goal orientations when considering the goal commitment and creativity relationships.

Second, H2.2 and H2.3 were supported because shared identity correlated positively and significantly with team performance ($\gamma = .345$, $p = .01 < .05$) and creativity ($\gamma = .351$, $p = .01 < .05$) in virtual teams. Previous face-to-face team research clearly supported the importance of shared identity for increased cooperation, coordination, and trust (Spears & Lea, 1992). Also, creating a cohesive atmosphere and shared identity positively increases team performance (Gully et al., 2012). By collaborating and sharing knowledge, team performance can be enhanced through members learning from each other (Lee et al., 2010).

Shared identity among virtual team members had a positive effect on team performance, which was supported by literature (Paul et al., 2016; Watanuki, Watanuki, Moraes, & Moraes, 2016). Also, the positive and significant relationship between shared identity and team creativity in a virtual team setting was found (Mortensen & Hinds, 2001; Ocker, 2005). However, due to the lack of empirical research examining the direct relationship between shared identity and actual team

outcomes in virtual teams, the findings of Hypothesis 2.2 and 2.3 provide a missing piece of the puzzle that may be used to depict the importance of shared identity in the team performance and creativity literature.

Third, H2.5 was supported because team trust correlated positively and significantly with team creativity in virtual teams ($\gamma = .503$, $p = .01 < .05$), but H2.4 was not supported as team trust did not correlate positively and significantly with team performance in virtual teams ($\gamma = .110$, $p = .214 > .05$). The above findings may be difficult to interpret, but it may be true that creating trust among virtual team members may be more difficult than face-to-face teams due to impaired communication quality (Greenberg, Greenberg, & Antonucci, 2007). Also, the establishment of trust in virtual teams may be inhibited because members may feel a disruption in trust if they do not receive a timely response from their teammates (Gibson & Cohen, 2003). However, more research is needed to examine this further.

In regards to team creativity (H2.5), face-to-face team researchers supported the importance of trust on team creativity (Madjar & Ortiz-Walters, 2009; Tsai, Chi, Grandey, & Fung, 2012). For example, Tsai et al. (2012) found that a positive team affective tone was beneficial for team creativity when team trust was low but a negative group affective tone was high. Not many studies explored the relationship between trust and team creativity in a virtual team setting, however, a qualitative study suggested that a concept of trust-based open communication can develop effective virtual team creativity in a virtual team setting (Han et al., 2017).

In a previous empirical study with 82 student teams at a large university in the US, two dimensions of trust—cognitive and affective trust—were tested on team creativity (Barczak et al., 2010). The results indicated that only cognitive trust was a significant predictor of creativity while affective trust was not significant (Barczak et al., 2010). Comparing the result from the present study reveals the need to consider trust as several dimensions rather than one. For example, affective trust is the confidence one places in a team member based on one's feelings, and cognitive trust is based on one's responses to a team member's expertise and reliability (McAllister, 1995). The 10 items used in this study for Trust included both affective and cognitive trust but did not show up as two factors in EFA in face-to-face teams, and this may be a reason why the results of this study are puzzling.

Implications

The findings have several implications. These following implications reinforce the existing HRD theories, research, and practice.

Theoretical Implications

Even if several scholars presented the antecedent conditions of team processes that enable shared leadership to develop (Carson et al., 2007), few scholars explored the impact of shared leadership on team process factors, which increases team performance and creativity. This study has demonstrated the effects of shared leadership on team process factors and performance/creativity by using the input-process-outcome (I-P-O) framework (Hackman, 1987; McGrath, 1964; Salas, Stagl, & Burke, 2004) to illustrate the pattern of emergent team processes. Given the

encouraging results obtained in the present study, some avenues of research are proposed to further develop knowledge about shared leadership, team processes, and team performance and creativity.

This study attempted to understand if task-related shared leadership and relation-oriented leadership can be used as separate dimensions in explaining the variance of team processes that led to creativity and project output. The EFA, CFA, and SEM results of this study supported the fact that the two dimensions were two different constructs, even though the correlation between TOSL and ROSL was high. Similar to Grille and Kauffeld (2015), this study tested the shared leadership with TOSL and ROSL as separate dimensions for the first time with virtual student teams. Therefore, future scholars should use these dimensions in different contexts to validate this measurement.

Other scholars on shared leadership found different results in regards to the relationship between shared leadership and team performance. The inconsistent results of shared leadership and its dimensions may be a result of the way shared leadership has been conceptualized (Wang et al., 2014). Some studies measured shared leadership with the aggregation of a team-level, social network approach, density of a network, or network centralization as an index of shared leadership in teams (D'Innocenzo et al., 2014). Likewise, earlier studies on shared leadership have not used consistent measurements or instruments (transformative, transactional leadership, etc.) that capture leadership distribution, so the proposed relationships have not been tested

directly, which should draw future researchers' attention. For example, a multi-trait, multi-method study needs to be done to compare the different measures.

In this study, Psychological Safety (PS) was not significantly associated with Trust in the virtual team setting. Squared multiple correlations of PS items in the SEM model were lower than any other scale. This suggests that the PS scale may have an issue, even if Edmondson's (1999) 7-item measure was developed based on rigorous scale construction and has been exposed to extensive validation tests, which was shown that measure has strong content and construct validity across diverse samples in face-to-face settings (Newman et al., 2017). Future researchers need to investigate if PS only works in a face-to-face team setting, not in a virtual team context. In addition, based on EFA results, only reversed items were loaded in a PS factor. Examples of reversed items on Psychological Safety are: "People on this team sometimes reject others for being different (reversed)" and "If you make a mistake on this team, it is often held against you (reversed)". These findings help build an advanced scale to capture the concept of a psychologically safe environment among team members.

Practical Implications

The present findings have several implications for educators in terms of instructional design, coaching, training, and learning culture in higher education. In this study, the team process model was developed with the fact that shared leadership enabled team members to build trust, establish shared identity, and encourage commitment to the goal, which eventually enhance team performance and creativity for the most part. Practitioners should consider team contexts when fostering shared

leadership when developing interventions. Constraints on team autonomy and shared leadership should be acknowledged, and members should be encouraged to work within whatever framework exists in each institution.

University instructors can coach students to practice effective shared leadership behaviors and teaming behaviors that increase team performance and creativity. In addition, instructors need to acknowledge that modern day learning systems are more flexible and adaptable to different levels of learning strategies. In the past, instructors were the ones who usually controlled students' learning because instructors designed the courses with a teacher-centered rather than student-centered approach (Bergmann, & Sams, 2014). Therefore, empowering students to manage their own learning and foster creative thinking and actions by creating positive and supportive environments is important to supplement the effect of formal courses. Instructors should design team activities so that students can remove their fear of sharing creative ideas.

This research suggests that virtual and face-to-face interactions may not be significantly different now due to the development of technology, since virtual communication now enables immediate feedback through overcoming the limitations of time and space (Malhotra & Majchrzak, 2014). When instructors create a positive technology-based learning culture, regardless of face-to-face courses or online courses, students will learn more effectively. According to a meta-analysis study with 1,105 experimental studies of technology use in higher education (Schmid, Bernard, Borokhovski, Tamim, Abrami, Surkes, & Woods, 2014), learning is best supported

when the student is actively engaged via technological tools that provide cognitive support. This technology-based learning culture may increase students' potential to share leadership and other team process factors.

In addition, the trend of virtual work means significant changes in how team members build their relationships (Robey, Khoo, & Powers, 2000). A set of theoretically based strategies or instructional processes is based on the practice of designing and delivering instruction to ensure understanding and enactment of appropriate team competencies (Salas & Cannon-Bowers, 1997). There are many leadership development programs that target the necessary skills for leaders in a face-to-face team setting, but few scholars explored their utility in electronically-mediated teams. For examples, VT communication training led to increasing perception of cohesion and satisfaction with process over time and improved performance (Warkentin & Beranek, 1999). Also, leadership was perceived to be extremely valuable for future VT activities, particularly the following leadership skills: leading a meeting (72%), coaching and mentoring (70%), monitoring (68%), and evaluating and rewarding (56%) (Rosen, Furst, & Blackburn, 2006). Taking an active role in creating a positive atmosphere for the teams made it easier to learn how to use new technology and helped them cope with interpersonally-challenging behavior (Edmondson, 2003).

Finally, the team process model of this study may work as a training checklist for virtual team leaders and members to determine how to address specific challenges and how to build team skills. It is important to remember that all team processes are interrelated to improve VT team skills (Han & Beyerlein, 2016). All levels of processes

including (a) behavioral, (b) social, and (c) cognitive processes should be addressed. Behavioral processes include effort exerted, quantity and quality of task-related communication, specific task performance, and task coordination (Pearce & Ravlin, 1987). The social processes include trust in the team, cohesion, shared identity, and satisfaction (McGrath, 1964; Pearce & Ravlin, 1987). The cognitive processes relate to learning and sharing knowledge (Valentine, Nembhard, & Edmondson, 2015). In the long term, the list of successful team behaviors can guide the creation of a curriculum for shared team leadership development to increase success in a virtual environment.

Limitations

Some limitations exist in this study. First, the generalizability of the results may be limited because the study used a sample of undergraduate and graduate students from one large Southwestern university in a single department. Second, the number of participants in the face-to-face and virtual team samples is somewhat small, because this study analyzed only the survey respondents who answered a questionnaire for both Team Enabler Survey (TES) and Team Process/Outcome Survey (TPOS). Therefore, further research is required to collect more diverse and abundant samples. Third, this study focused on the effects of shared leadership in the early stage of team development (the beginning of the semester) on team performance at the later stage of team development (the end of the semester). As shared leadership in work teams was examined at the beginning phases, it would be helpful to explore the effects of shared leadership across the timeframe. However, a semester is generally about four months, so the interval is too short to collect data for three or more time points. Future research

in school settings could face similar problems due to the short semester lengths for collection at three time points.

Fourth, a self-reported instrument was used, which may be subject to respondent biases, such as the inability to give accurate responses because of insufficient recall or memory or the possibility of providing biased answers. In addition, even if predictor variables and dependent variables were collected by different methods and at different times, a common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) could occur in this study. As with all other times when using the same Likert-type scale, the variance the scales shared with each other represented a response bias. Future researchers may use different ways to measure performance and creativity. For example, instructors can measure performance by grading each team's product.

In regards to the result of the model, a strong and significant relationship between psychological safety and group process variables was not found in this study. As shared leadership was the largest and most significant predictor of team processes, psychological safety construct may have lost the power in this model. Also, the loadings in Figure 4 show PS the lowest coefficients. That seems to mean PS was not well measured, that the scale lacks reliability.

Lastly, due to multicollinearity concerns and factor loading concerns, when the relationships among the latent variables used were examined, a few latent variables were reevaluated, and some were removed in subsequent analyses to improve the model accuracy.

Recommendations for Future Research

A number of ideas explored in this study warrant further examination by scholars. For example, future research in other settings, such as companies, can examine this model by using at least three-time points. Measuring shared leadership in the early stage, team process factors in the middle stage, and team performance in the final stage of team development would be the best option for future researchers.

Second, this study used the I-P-O model (Hackman, 1987) to illustrate the pattern of emergent team processes. However, this research can be developed by using the framework of input-mediator-output-input (IMOI) by adding the extra "I" at the end to note cyclical causal feedback (Ilgen et al., 2005) because the IMOI framework may apply to work settings.

Third, this study's model of shared leadership may be applicable to different settings with other types of teams (e.g., hybrid or blended teams) performing different tasks (e.g., complex task and longer task in companies). By conducting studies in the workplace or other institutions, researchers can test if the results obtained in this study can be replicated in other environments by adding different organizational variables (e.g., organizational culture, leadership styles, and so on).

Fourth, the relationship between shared leadership and team performance was not directly explored. However, some scholars have theoretically proposed (Ensley et al., 2003) or found that shared leadership was positively related to team performance (Ishikawa, 2012; Small & Rentsch, 2010; Wood & Fields, 2007). D'Innocenzo et al. (2014) provided meta-analytic support for the positive relationship between shared

leadership and team performance. However, several scholars failed to find support for the idea that shared leadership led to better team performance (Boies et al., 2010, Mehra et al, 2006). Boies et al. (2010) found that using a transformational leadership dimension of shared leadership had negative effects on team performance.

Fifth, the different effects and dynamics of ROSL and TOSL in virtual teams and face-to-face teams need to be further examined. TOSL and task-related communication can be basic tools to make work happen in a team (Hoegl & Gemuenden, 2001). Communication in face-to-face teams has some benefits because visual interactions from gestures or facial expressions help members to avoid misunderstanding (McDonough et al., 2001). However, virtual teams may face some challenges due to geographical distance and lack of socio-emotional richness compared to face-to-face communications (Al-Ani et al., 2011; Han & Beyerlein, 2016).

Sixth, the meanings of shared leadership, trust, goal commitment, and shared identity need to be specifically defined, and sub-scales need to be used depending on situations and context of the research. For example, depending on which goal commitment (learning versus performance) team members pursue and which commitment researchers desire to measure, the results may change. All of these constructs have several sub-dimensions, so researchers need to be cautious about which part they want to focus on.

Seventh, the research on team goal commitment suggested that goal commitment is a determinant of team performance, however, other criteria of team effectiveness, such as creativity, is still in infancy. For example, few scholars have

examined the influence of goal commitment on team creativity (Hirst, Van Knippenberg, Chen, & Sacramento, 2011). They found that a performance-oriented goal commitment was positively related to creativity when team members' freedoms were more valued and less controlled. However, few scholars argued that goal commitment will be negatively associated with creativity because of time pressure on task completion rather than the generation of novel ideas (Hon, & Kim, 2007). Likewise, there is a great deal of ambiguity between goal commitment and creativity in the literature, so future researchers need to investigate the relationship between goal commitment and team creativity in both face-to-face and virtual team setting.

Lastly, the effect of frequent communication among team members was not explored in relation to team performance or creativity. In a virtual team setting, communication is maintained solely through electronic means, but studies on the effects of these processes on team creativity and performance still remain scarce. Virtual teams tend to engage in less communication and take a longer time to complete a complex creative task (Straus & Olivera, 2000). Kratzer, Leenders, and Van Engelen (2010) found that the higher the variability in using different means of communication, the higher is the creative performance of virtual teams. Paul et al. (2016) found that establishing appropriate project coordination systems promoted project performance. However, previous researchers found that a high frequency of communication (more than a necessary minimum) and subgroup formation of communication may decrease the creative performance of innovative teams (Amabile & Conti, 1999; Kratzer, Leenders, & Van Engelen, 2004). Different results led to a necessity to examine the

effects of communication in relation to team performance and creativity in both settings. Therefore, future researchers may need to investigate the team process model by adding a communication factor.

Conclusion

Our findings highlighted the importance of shared leadership for goal commitment, shared identity, and trust, which in turn led to a better team performance and creativity. This team process model will provide researchers a guide for further exploration of possible intervening variables that may increase team performance when shared leadership plays a role. Additionally, this team process model will help educators when developing a strategic intervention to enhance student team's performance and creativity.

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APPENDIX A

Constructs and Measurement Items

Scales	Measurement items	Sources
Shared leadership (10 items)	Task leadership orientation • As a team we clearly assign tasks. • As a team we clearly communicate our expectations. • As a team we provide each other with work relevant information. • As a team we ensure that everyone knows their tasks. • As a team we monitor goal achievement Relation leadership orientation • As a team we take sufficient time to address each other's concerns. • As a team we recognize good performance. • We promote team cohesion. • We support each other in handling conflicts within the team. • As a team we never let each other down.	Grille & Kauffeld, 2015
Psychological safety (7 items)	• If you make a mistake on this team, it is often held against you. (R) • Members of this team are able to bring up problems and tough issues. • People on this team sometimes reject others for being different. (R) • It is safe to take a risk on this team. • It is difficult to ask other members of this team for help.(R) • No one on this team would deliberately act in a way that undermines my efforts. • Working with members of this team, my unique skills and talents are valued and utilized.	Edmondson, (1999)
Trust (10 items)	• My team members tell the truth in negotiations. • My team members meet their negotiated obligations to our team. • In my opinion, my team members are reliable. • My team members negotiate honestly with me.	Hakonen, 2010

	• My team members will keep their word. • My team members do not mislead me. • My team members negotiate joint expectations fairly. • My team members approach their job with professionalism. • I see no reason to doubt my team members' competences. • I can rely on my team members not to make my job more difficult by careless work.	
Shared identity (11 items)	• I feel loyal toward the team. • I see myself as a member of the team. • I am pleased to be a member of the team. • I can count on the team to help me when I need help. • The team is willing to help me solve problems. • I would accept almost any type of job assignment to keep working in the team. • I am proud to tell others that I am part of the team. • I would recommend to close friends that they join the team. • I am proud to think of myself as a member of the team. • When someone praises the accomplishments of the team, I feel it is a personal compliment to me. • I help others in the team who have heavy workloads.	Mortensen & Hinds, 2001
Goal commitment (3 items)	• We are committed to pursuing the team's goal. • We think it is important to reach the team's goal. • We really care about achieving the team's goal.	Aubé, & Rousseau, 2005
Performance (4 items)	• Content (Quality of facts, research, ideas, and solutions for the final product) • Efficiency (How well the team used available resources including time, knowledge, and experts) • Excellence (How well the product achieves the goals of the project) • Originality (How creative and original the product is)	Hinds & Mortensen, 2005

Creativity (3 items)	• How would you rate the newness and originality of the solutions your team finds to problems? • How would you rate the number of possible solutions your team develops to solve problems? • How would you rate the number of possible solutions your team takes into consideration in order to solve problems?	Kratzer, Leenders, & Van Engelen, 2010

Note: Group-level composite scores are computed by averaging responses across items and respondents. Reverse scored items are indicated by (R).
(1) All items are measured with perceptual 5-point Likert scales.

APPENDIX B

Original Consent Form and Questions

You are invited to take part in a research study, "Project Team Experiences in Higher Education", being conducted by graduate student, Soo Jeoung (Crystal) Han, at Texas A&M University, under the supervision of Professor Michael Beyerlein. The information in this form is provided to help you decide whether or not to take part in this project.

The purpose of this project is to examine the relationships among psychological safety, team process factors, and team performance on both virtual and face-to-face team project. You are being asked to be in this study because you are in a course that assigns team projects. One hundred teams will be invited to participate in this study in the EAHR Department at TAMU. You will be asked to answer questionnaire early in the semester that takes about 15 to 20 minutes (February, 2016) and another questionnaire late in the semester (April, 2016). Please rate your current project team experience for the class. Your team performance will be evaluated by your professor as a part of the research.

To encourage participation in this study, the student project teams where all members complete the survey will be entered into a drawing for $25 Amazon gift cards. If the team wins, each member receives a gift card. One team will be chosen from the undergraduate teams entered and one team from the graduate teams entered for the prizes at the beginning and at the end of the semester. The instructor may also give some extra credits for participation.

Please be open and candid with your responses. All information you provide will be strictly confidential in accordance with the protocol of Texas A&M University Institutional Review Board (IRB). The collected data of this study will be kept private. No identifiers linking you to this study will be included in any sort of report that might be published. Collected data will be stored securely, and only the researcher will have access to the records. Information about you will be stored in computer files protected with a password. Furthermore, your responses will only be presented in aggregate, and no single individual's results will be highlighted.

People who have access to your information include the Principal Investigator and research study personnel. Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University Human Subjects Protection Program may access your records to make sure the study is being run correctly and that information is collected properly. Information about you related to this study will be kept confidential to the extent permitted or required by law.

You may contact Professor Michael Beyerlein to talk about a concern or complaint about this research at 979-862-4347, Beyerlein@tamu.edu. You may also Soo Jeoung (Crystal) Han at 979-739-6341, Crystalhan82@gmail.com. For questions about your rights as a research participant, to provide input regarding research, or if you have questions, complaints, or concerns about the research, you may call the Texas A&M University Human Research Protection Program office by phone at 1-979-458-4067, toll free at 1-855-795-8636, or by email at irb@tamu.edu.

This research is voluntary, and you have the choice whether or not to be in this research study. You may decide to not begin or to stop participating at any time. If you choose not to be in this study or stop being in the study, there will be no effect on your student status, medical care, employment, evaluation, relationship with Texas A&M University, etc.

CONSENT STATEMENT
I voluntarily agree to participate in this research survey of "Project Team Experiences in Higher Education" being conducted by Soo Jeoung (Crystal) Han, of the Department of Educational Administration & Human Resource Development at Texas A&M University. The procedures, risks, and benefits have been explained to me, and my questions have been answered. I understand that any identifiable information in regards to my name will remain confidential, that is, this information will not be listed in the dissertation of any future publication (s).

- o I accept.
- o I do not accept.

The following questions are being asked to gather demographic information about respondents. The information you provide cannot be traced back to you and will only be used to compare subgroups to see how opinions vary between these groups.

I. Demographic Information
Please choose the appropriate answer that best describes or applies to you.

- What is your gender?
  1. Male 2. Female

- Please provide the last four digits of your phone number.

- What is your age?
  [Entering the age]

- What is your ethnic background?
  1. White 2. African American 3. Hispanic 4. Asian 5. Native American 6. Other

- What degree are you presently seeking?
  1. Human Resource Development
  2. Technology Management
  3. Other

- What is your academic classification?
  1. Freshman
  2. Sophomore
  3. Junior
  4. Senior
  5. M.S. student
  6. Ph.D. student

- How long have you been employed full-time in both previous and current organizations in total?
  1. Less than 1 year 2. 1-5 years 3. 6-10 years 4. 11-15 years 5. More than 16 years

II. Team Information

Think of the project team that you are currently on for this course. If you are taking more than one class that requires to answer this survey, please make sure to answer each team experience separately. The remainder of these items asks about your experiences on that specific team.

- What is the name of the course that you are in? [dropdown box]
  EHRD 203 FOUNDATIONS HR DEV (Dr. Yeager) (3)
  EHRD 203 FOUNDATIONS HR DEV (Dr. Fowler) 10:20am-11:10am (28)
  EHRD 203 FOUNDATIONS HR DEV (Dr. Fowler) 11:30am-12:20pm (29)
  TCMG 272 TECH & END USER SUPPORT (Dr. Smith) (4)
  EHRD 374 ORGANIZATIONAL DEVELOPMT Section 500 (Dr. Muyia) (9)
  EHRD 405 LEADERSHIP IN HRD/TCM (Dr. Yeager) 2:20pm-5:10pm (5)
  EHRD 405 LEADERSHIP IN HRD/TCM (Dr. Yeager) online class (31)
  EHRD 408 GLOBAL DIV IN WORKPLACE (Dr. Sandoval) (7)
  TCMG 412 CONTEMP ISSUES IN TCM (Dr. Jones) (6)
  EHRD 481 CAPSTONE SEMINAR HRD/TCM (Dr. Fowler) (11)
  EHRD 603 APPLIED THRETL FOUND HRD (Dr. Dooley) (12)
  EHRD 605 PRIN&PRAC LDRSHIP HRD (Dr. Dooley) (13)
  EHRD 613 CAREER DEV IN HRD (Dr. Dirani) (14)
  EHRD 614 STRATEGIC PLANNING HRD (Dr. Beyerlein) (15)
  EHRD 625 Organization Development & Performance in HRD (Dr. Beyerlein) (1)

- What is your group number in this course?
  [Select from dropdown 1-25]

- How long is your team expecting to work together in this semester?
  1. Less than 5 weeks
  2. 5 to 8 weeks
  3. 9 to 12 weeks
  4. 13 to 16 weeks
  5. More than 16 weeks

- Including yourself, how many members are on the team?
  [Select from dropdown 3-8]

- How frequently does your team meet face-to-face with all members?
  1. Never, not applicable
  2. Less than once a month
  3. Once a month
  4. Twice a month
  5. Once a week
  6. A few times a week
  7. Daily

- How frequently does your team meet electronically with all members?
  1. Never, not applicable
  2. Less than once a month
  3. Once a month
  4. Twice a month
  5. Once a week
  6. A few times a week
  7. Daily

- Please indicate what percentage of your teamwork was conducted via the following platforms (answers will total 100).
  1. Videoconferencing (WebEx, Skype Video)
  2. Audioconferencing (Phone, Skype without Video)
  3. Emails (Gmail, Hotmail)
  4. Project Management Platforms (Basecamp)
  5. Instant Messaging (Chat, SMS)
  6. Face-to-Face interaction
  7. Personal telephone call
  8. Shared databases/groupware (Google Docs, Dropbox)
  9. Other (enter response)

III. Team Process Enabler

Psychological safety (1. Very inaccurate – 5. Very accurate)

Please indicate for the items below how much you agree or disagree with each statement concerning your experience with the project team for this course.

- If you make a mistake on this team, it is often held against you.
  1. Very inaccurate – 5. Very accurate
- Members of this team are able to bring up problems and tough issues.
  1. Very inaccurate – 5. Very accurate
- People on this team sometimes reject others for being different.
  1. Very inaccurate – 5. Very accurate
- It is safe to take a risk on this team.
  1. Very inaccurate – 5. Very accurate
- It is difficult to ask other members of this team for help.
  1. Very inaccurate – 5. Very accurate
- No one on this team would deliberately act in a way that undermines my efforts.
  1. Very inaccurate – 5. Very accurate
- Working with members of this team, my unique skills and talents are valued and utilized.
  1. Very inaccurate – 5. Very accurate

Shared leadership (1. Strongly disagree – 5. Strongly agree)

Think about your team members and not your official team leader while answering the questions.

Task leadership orientation

- As a team we clearly assign tasks.
- As a team we clearly communicate our expectations.
- As a team we provide each other with work relevant information.
- As a team we ensure that everyone knows their tasks.
- As a team we monitor goal achievement

Relation leadership orientation

- As a team we take sufficient time to address each other's concerns.
- As a team we recognize good performance.
- We promote team cohesion.
- We support each other in handling conflicts within the team.
- As a team we never let each other down.

IV. Team Processes

Please answer the following questions using the scale provided based on your experience in the most recent meeting with your team members.

Team goal commitment (1. Totally not true – 5. Totally true)

- We are committed to pursuing the team's goal.
- We think it is important to reach the team's goal.
- We really care about achieving the team's goal.

Shared identity (1. Not at all – 5. Very much)

- I feel loyal toward the team.
- I see myself as a member of the team.
- I am pleased to be a member of the team.
- I can count on the team to help me when I need help.
- The team is willing to help me solve problems.
- I would accept almost any type of job assignment to keep working in the team.
- I am proud to tell others that I am part of the team.
- I would recommend to close friends that they join the team.
- I am proud to think of myself as a member of the team.
- When someone praises the accomplishments of the team, I feel it is a personal compliment to me.
  I help others in the team who have heavy workloads.

Please indicate the extent to which you agree or disagree with the following statements.

Trust (1. Strongly disagree – 5. Strongly agree)

- My team members tell the truth in negotiations.
- My team members meet their negotiated obligations to our team.
- In my opinion, my team members are reliable.
- My team members negotiate honestly with me.
- My team members will keep their word.
- My team members do not mislead me.
- My team members negotiate joint expectations fairly.
- My team members approach their job with professionalism.
- I see no reason to doubt my team members' competences.
- I can rely on my team members not to make my job more difficult by careless work.

IV. Team Outcome
Please answer the following questions based on your experience with your class team members in this course.

Team Performance (1. Poor quality – 5. Excellent quality)
What did your team produce – a paper, a presentation, a model, or something similar? How did it turn out?

- Content (Quality of facts, research, ideas, and solutions for the final product)
- Efficiency (How well the team used available resources including time, knowledge, and experts)
- Excellence (How well the product achieves the goals of the project)
- Originality (How creative and original the product is)

Team Creativity (1. Strongly disagree – 5. Strongly agree)

- How would you rate the newness and originality of the solutions your team finds to problems?
- How would you rate the number of possible solutions your team develops to solve problems?
- How would you rate the number of possible solutions your team takes into consideration in order to solve problems?

APPENDIX C-1

Study Participation Invitation of Instructors

Subject: Project Team Experiences in Higher Education Survey Invitation

Dear Professor,

My name is Soo Jeoung (Crystal) Han, who is a Ph.D. student in an Educational Human Resource Development program. I am planning to conduct a survey with your students that you are teaching, under the supervision of Professor Michael Beyerlein.

The purpose of this project is to examine the relationships among psychological safety, team process factors, and team performance on both virtual and face-to-face team project. If you are teaching a course that assigns team projects in the EAHR Department at TAMU, please help us conduct questionnaires asking the students' perceptions on team experiences so that they can better perform as a team member. Students will be asked to answer questionnaire early in the semester that takes about 15 to 20 minutes (February, 2016) and another questionnaire late in the semester (April, 2016).

To encourage participation in this study, the student project teams where all members complete the survey will be entered into a drawing for $25 Amazon gift cards. If the team wins, each member receives a gift card. One team will be chosen from the undergraduate teams entered and one team from the graduate teams entered for the prizes at the beginning and at the end of the semester. You may also give some extra credits for participation so that they can be motivated. For those who do not want to participate in this study, we encourage you to provide other assignments that can be done to earn the extra credits, such as writing a summary of team research article.

You may contact Professor Michael Beyerlein to talk about a concern or complaint about this research at 979-862-4347, Beyerlein@tamu.edu. You may also Soo Jeoung (Crystal) Han at 979-739-6341, Crystalhan82@gmail.com. I hope to hear from you. Thank you in advance.

Sincerely yours,

Crystal Han

Crystal (Soo Jeoung) Han | Doctoral Graduate Assistant

Phone: 979-739-6341
E-mail: CrystalHan82@gmail.com

APPENDIX C-2

Team Project Grading Rubric Rated by Students

What did your team produce – a paper, a presentation, a model, or something similar? How did it turn out? Please rate the team's final product on the scale below between 1 (poor quality) and 5 (excellent quality).

Categories	Type	1 = Poor	2 = Less than expected	3 = Adequate	4 = Good	5 = Excellent
1	Content (Quality of facts, research, ideas, and solutions for the final product)					
2	Efficiency (How well the team used available resources including time, knowledge, and experts)					
3	Excellence (How well the product achieves the goals of the project)					
4	Originality (How creative and original the product is)					