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Virtual Team Communication Norms: Modeling the Mediating Effects of Relational Trust, Presence, and Identity on Conversational Interactivity, Openness, and Satisfaction

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5.1 Introduction

For individuals who work or game together online, the difference between a successful collaboration and disappointment often hinges on the quality of a virtual team's communication. Over time, teams develop communication norms of conversational interactivity, openness, and satisfaction. These norms are often unstated, but become part of the team's routine ways of communicating, including participants' ideas about appropriate topics of conversation, expectations of feedback, appropriate turn-taking behaviors, openness to self-disclosure, and satisfaction with the ongoing interaction among group members.

In virtual teams, developing and maintaining effective communication norms for conversational interactivity, openness, and satisfaction are often difficult. Several aspects of participant computer-mediated communication (CMC) competence, such as skill, efficacy, and confidence, influence the development of these norms (Sherblom, Withers, & Leonard, 2013; Sundararajan, 2009, 2010). Relational attributes, such as trust, presence, and identity also have an effect on virtual team communication (Leonard et al., 2015). Managing these various influences is essential to effective virtual team collaboration.

Developing an effective collaboration within a virtual environment is particularly important to teams whose members are geographically dispersed. The ability to share ideas freely, strategize together, be understood by other team members, and feel connected to other participants through their avatar representations is important to constructing a shared virtual team relational space in which to interact (Leonard & Withers, 2009). Developing this shared virtual space in which members feel a sense of togetherness builds team cohesion and facilitates effective communication.

The purpose of the present study is to examine two types of influences on virtual team collaboration. We analyze these influences by surveying participants

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at universities in the United States and eastern Europe after they have engaged in team problem-solving projects in the virtual environment of *Second Life*®. Our survey measures the personal competence of participants in using the CMC medium, the relational attributes among team members, and the norms of team conversation that develop. The study then models the influences of personal competence and relational attributes on these team conversational norms. We predict that personal competence, as measured through each individual's level of skill, efficacy, and confidence in using the CMC medium, is necessary but not sufficient to facilitate interactive, open, and satisfying virtual team communication. In addition to this personal competence, team members must develop the relational attributes of trust, presence, and identity to facilitate interactive, open, and satisfying communication.

5.2 Background

This study is grounded in three eras of CMC theory development that inform the understanding of computer-mediated communication (Houtman Makos, & Meacock, 2014; Oztok & Brett, 2011). The first era focuses on the influence of the medium. The second describes the communication competencies of the people engaging in CMC. The third analyzes the relationships that develop among those people in their interpersonal relationships, virtual teams, and communities.

Theories representing the first era, such as media richness, emphasize the role of the medium as a major influence on communication, in a way that is sometimes referred to as technological determinism (Daft & Lengel, 1986; Lengel & Daft, 1988; Trevino, Daft, & Lengel, 1990). Walther and his colleagues provide reviews and critiques of these early perspectives (Walther, 2004; Walther, Loh, & Granka, 2005; Walther & Parks, 2002). The more recent theories of the second era, such as social information processing and media naturalness, focus on how communicators develop personal competence in using the medium (Kock, 2004, 2005; Walther, 2009, 2010). This personal competence is often measured in an individual's perceived skill, efficacy, and confidence in communicating with others through the medium. The third era is represented in theories such as the hyperpersonal perspective and theories of virtual community that analyze the relational influences that shape CMC and the development of relationships in virtual environments (Walther, 2010; Willson, 2006).

Taking this third perspective, Leonard et al. (2015) argue that personal competence with a CMC medium is necessary, but not sufficient, for effective

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virtual team communication. They suggest that competence with the medium is required but, in addition, virtual team members must develop a sense of relational trust, presence, and identity for the team to achieve interactivity, openness, and member satisfaction in its conversations. Only with the development of relational trust, presence, and identity, in addition to personal skill, efficacy, and confidence, can a virtual team achieve conversational interactivity, openness, and satisfaction. Their study shows that these relational attributes can be developed through participant training programs, but they do not directly test the relationship of these relational attributes to team member conversational participation.

The present study compares two path analysis models. The first model examines the influence of personal competence, as measured in an individual's skill, efficacy, and confidence, on virtual team conversational norms. The second model includes the relational influences of trust, presence, and identity on the virtual team's conversational interactivity, openness, and satisfaction. The goal of the study is to test whether these relational attributes contribute substantially to the personal competence influences described by Leonard et al. (2015).

5.3 Personal Competence: Skill, Efficacy, and Confidence

Several lines of research describe the influence of CMC competence on virtual team communication. One line identifies participant skill with using the CMC medium as a primary influence (Bubas, Radosevic, & Hutinski, 2003). A second focuses on how a person's sense of efficacy in using the medium affects communication (Kelly et al., 2010; Wrench & Punyanunt-Carter, 2007). A third examines the confidence of participants in being able to express themselves appropriately, interpret the meanings of others, engage in smooth virtual conversations, and develop social relationships as a major influence (Spitzberg, 2006). These three lines of research indicate that skill, efficacy, and confidence each play an influential role and each competency must be developed over time, through individual effort and experience with the medium, for effective team communication to occur.

Media naturalness theory predicts that virtual communication initially requires more time, cognitive effort, and experience to develop these skills. It argues that humans have become adapted through evolution with neurologically optimized brains designed to function most efficiently in synchronous face-to-face communication, with its auditory and visual cues that assist in the interpretation of another person's meaning (Kock, 2004, 2005). The less a communication medium incorporates colocated, face-to-face, synchronous speech,

the greater the cognitive effort required for a person to both convey and understand meaning. Over time, people can develop the cognitive schemas and social skills needed to communicate effectively in a virtual environment, but developing these schemas and learning the appropriate skills requires substantial cognitive effort and practice (DeRosa et al., 2004; Kock, 2008; Kock, Verville, & Garza, 2007). Once people develop the cognitive schema and social skill to communicate effectively through a medium, however, the virtual environment begins to feel more natural and participants experience greater cognitive ease in coordinating and managing their meanings with others (Kock, 2004, 2005). Hence, personal skill, efficacy, and confidence are important to communicating effectively in a CMC medium.

5.3.1 Skill

Skill with communicating in a CMC medium develops through repeated interaction with others and is a major influence on a person's ability to be expressive, attentive to others, and engage in smooth conversational coordination (Bubas et al., 2003). Expressiveness recognizes the ability to create messages that seem alive and animated to others. Attentiveness shows in a person's interest, concern, affection, and adaptability to others. Coordination means being able to achieve smooth conversational transitions, timing, topic initiation, and conversational repairs as needed (Bubas et al., 2003).

5.3.2 Efficacy

Efficacy describes the belief among participants that they have the necessary cognitive schema and social abilities to communicate effectively through a medium. Some communicators experience CMC reticence, apprehension, anxiety, and inhibition, which can reduce their ability to express their meanings and emotions effectively (Kelly et al., 2010). Hence, anxiety, apprehension, and reticence affect a person's ability to communicate effectively in a virtual medium (Wrench & Punyanunt-Carter, 2007).

5.3.3 Confidence

Confidence is the sense that one has the social knowledge and skill to communicate, and the ability to accurately interpret the meanings of others (Spitzberg, 2006). A virtual environment has particular communication constraints and affordances, and a participant must develop an ability to communicate effectively within them (Erhardt et al., 2016). A person's confidence in having the

ability to perform competently within a virtual environment affects the willingness and motivation to participate. Confidence builds over time as a person experiences successful virtual conversations and develops relationships with others (Spitzberg, 2006). These positive experiences orient a person toward increased attentiveness, expressiveness, and willingness to engage in future conversations. This confidence facilitates conversational interactivity, openness, and the likelihood of satisfaction (Spitzberg, 2006).

5.3.4 Importance of Skill, Efficacy, and Confidence

Sherblom et al. (2013) use regression analysis to examine the influence of skill, efficacy, and confidence on virtual team communication. They conclude that increased skill, efficacy, and confidence, as represented in a lack of apprehension, positively affect virtual team conversations. They do not, however, investigate the potential of relational influences.

Leonard et al. (2015) do examine the relational influences of trust, presence, and identity on virtual team conversation. Their qualitative analysis indicates that relational trust, sense of presence, and development of an online identity all affect virtual team interactivity, openness, and satisfaction (Leonard et al., 2015). Building on their findings, the present study examines these influences: first by modeling the effects of personal skill, confidence, and efficacy, and then by modeling the additional influences of relational trust, presence, and identity.

5.4 Relational Attributes: Trust, Presence, and Identity

5.4.1 Trust

Trust is a complex relational attribute that influences both face-to-face and virtual team communication (Feng, Lazar, & Preece, 2004; Henderson & Gilding, 2004; Himelboim et al., 2012; Sarker et al., 2011). Trust between communicators builds over time. It is assessed as reputations develop among participants who judge each other to be trustworthy, or not, based on patterns of behavior that fulfill or disappoint expectations. Trustworthiness is the perception that a person possesses a set of relational communication characteristics such as responsiveness, benevolence, cooperation, and integrity that are beneficial to the team (Beldad, de Jong, & Steehouder, 2010; Cheng & Macaulay, 2013; Henderson & Gilding, 2004; Jarvenpaa & Leidner, 1998; Morrison, Cegielski, & Rainer, 2012; Schiller, Mennecke, Nah, & Luse, 2014).

Some characteristics of a virtual environment, such as the reduced social cues, perception of anonymity, and asynchronous communication, can create

interpersonal uncertainty that hinders the development of trust and assessment of trustworthiness (Beldad et al., 2010; Henderson & Gilding, 2004; Jarvenpaa & Leidner, 1998; Nam, 2014; Turilli, Vaccaro, & Taddeo, 2010). It is possible, however, for communicators to compensate for these reduced social cues, increased anonymity, and asynchronous communication through clear, specific, frequent verbal statements and development of a social presence (Jarvenpaa & Leidner, 1998). Communicating with others through avatars provides adequate social information for participants to both express and assess trustworthiness over time (Henderson & Gilding, 2004; Turilli et al., 2010). Additionally, online relational trust builds as a participant's sense of presence. With that presence, participant feelings of connectedness, openness, and commitment to the group task increase (Beldad et al., 2010; Green-Hamann & Sherblom, 2014; Hains, 2014; Himelboim et al., 2012; Morrison et al., 2012).

5.4.2 Presence

Presence represents a person's subjective psychological state in which the individual does not perceive the technology as mediating the interpretation of sensory stimuli (Aymerich-Franch, 2010). Instead, the individual overlooks the technology as an influence on the interpretation of that experience (International Society for Presence Research, 2000). This conception of presence has moved away from a focus on the media richness or capacity as affecting a person's thoughts and feelings about the ongoing social, relational, and contextual processes in a virtual environment. Recent conceptualizations of presence focus more on how virtual community participants use the affordances of the medium to build relationships with other team members (Erhardt et al., 2016; Houtman et al., 2014; Kehrwald, 2008; Sherblom, 2010; Tu & McIsaac, 2002).

Thus, presence is a subjective, relational phenomenon that is dependent on the ability and willingness of participants to achieve interpersonal relationships with others. It represents a dynamic phenomenon rather than a simple learned behavior or skill (Kehrwald, 2008). Individuals must participate in an ongoing performance of presence that demonstrates to others that they have a willingness and ability to communicate within the virtual environment and to engage in interpersonal relationships (Kehrwald, 2008). This idea of presence places agency in the individual, rather than in the medium, and adds a relationally performative component. Participants must negotiate the medium, establish their presence through self-disclosure, and actively demonstrate that presence through ongoing relational cues that show an attentiveness, trust, empathy, rapport, and emotional expressiveness (Kehrwald, 2008; Sherblom, 2010).

The ability of individuals to effectively negotiate the virtual environment and construct this performative sense of presence in their conversations influences their ability to actively participate in the conversations of a virtual team and build personal satisfaction with those interactions (Houtman et al., 2014; Kehrwald, 2008).

The realism of the virtual environment, sophistication of avatar designs, and avatar-mediated communication facilitate this sense of presence (Jin & Bolebruch, 2010). Virtual team members frequently report experiencing high levels of presence in the vivid, immersive, three-dimensional spaces of virtual environments (Aymerich-Franch, 2010; Biocca, Kim, & Choi, 2001; Jin & Bolebruch, 2009; Leonard et al., 2015). Within this virtual environment, presence is associated with feelings of connectivity, immediacy, intimacy, warmth, mutual social awareness, involvement, and emotional accessibility (Green-Hamann, Eichhorn, & Sherblom, 2011; Jin & Bolebruch, 2009; Lee, 2004; Nowak, 2001; Sivunen & Nordbäck, 2015). These feelings produce important influences on a team's communication in the virtual environment, affecting team member interactivity, openness, and satisfaction.

5.4.3 Identity

The use of a screen name, or pseudonym, and consistently recognizable avatar appearance establishes a person's identity within a virtual community and helps develop an online reputation (Leonard & Toller, 2012). This identity contains both internal (personal) and external (social) components. The internal component is a person's self-belief, such as perceiving oneself to be honorable, competent, or funny. The external aspect represents how a person talks to and connects with others, and the types of social interactions that person participates in, such as belonging to and identifying with a particular group or maintaining friendships with certain types of individuals (Cheek & Briggs, 1982; Leary, Wheeler, & Jenkins, 1986). "Through their avatars and associated profiles, virtual world residents can establish their virtual identities, which can be molded according to their desires and expectations" (Nagy & Koles, 2014, p. 279). These virtual identities often represent a duality of self, similar to the dichotomy described by Cheek and Briggs (1982) and Leary et al. (1986). That is, a person's virtual identity embodies a self-representation made by the participant and an external representation that marks the choices made when communicating with others in the virtual environment (Seung-A, 2012). These internal and external choices are influenced by the person's knowledge of that virtual environment and affect the participation within it (DeGrove, Courtois, & Van Looy, 2015; Leonard, Withers, & Sherblom, 2010).

The relational attributes of trust, presence, and identity are essential to the development of successful virtual team communication. These attributes, along with personal competence, as measured in skill, efficacy, and confidence, influence communication norms that a team develops. Three measures of these norms are participant interactivity, openness, and satisfaction.

5.5 Team Conversational Norms: Interactivity, Openness, and Satisfaction

5.5.1 Interactivity

Interactivity includes the communication rate, feedback, turn-taking, timeliness, responsiveness, immediacy, and synchronicity that participants experience in a conversation (Karimi, Ramenzoni, & Holme, 2014; Tu & McIsaac, 2002). This interactivity is generally greater in a synchronous communication medium, such as in face-to-face discussion. In these face-to-face discussions the conversations are often more dialogic, open, and immediate, and the rate of information exchange is typically greater (Tu & McIsaac, 2002).

5.5.2 Openness

Openness describes an individual's level of comfort and ease with expressing personal thoughts, opinions, ideas, and emotions to others (Ayoko, 2007; Nam, 2014). This openness is reflected in a participant's willingness to self-disclose to the group (Goffman, 1959; Jourard, 1971). This self-disclosure is encouraged or discouraged by the interactivity norms established and implicitly maintained in the group. In a virtual team these openness cues may be communicated explicitly in words or demonstrated implicitly through such nonverbal cues as a person's avatar appearance, the topics discussed, or the verbal style of other participants (Gottschalk, 2010).

5.5.3 Satisfaction

Satisfaction is an affective response that represents an enjoyable, fulfilling experience (Hecht, 1978). Several factors affect an individual's level of satisfaction, including the communication climate of the group, amount of personal feedback received, and sociocultural expectations (Diener, 2000; Downs & Hazen, 1977). Participants who engage in group activities in a virtual environment often express satisfaction with the richness of the virtual environment, number of social cues available, sense of presence with others, and ease of participating (Hazel, Crandall, & Caputo, 2015; Nowak, Watt, & Walther, 2009;

Sherblom, 2010; Simon, 2010; Walther & Bazarova, 2008). The amount of feedback, complexity of information exchanged, and participant skill in using the medium all affect satisfaction (Walther & Bazarova, 2008). Adequate training and technical support positively influence participant satisfaction with a new CMC medium (Hiltz & Johnson, 1990; Leonard et al., 2015; Sherblom et al., 2013). The self-disclosure of other participants within that medium can increase a participant's communication satisfaction, as well (Morry, 2005).

5.6 Hypotheses

Following some early studies that focused mainly on media effects, a substantial amount of CMC research has shown the influence of personal competence, as measured in indices of skill, efficacy, and confidence, on virtual team conversational participation. In addition, much of this more recent CMC research suggests the influence of relational attributes such as trust, presence, and identity. At least one recent qualitative study of focus-group participants indicates that these relational influences affect the conversational participation of team members who meet in a virtual environment (Leonard et al., 2015). The present study examines whether these relational influences add substantially to the well-documented contributions of personal competence. The specific expectations of this study are stated in the following two hypotheses.

H1: The personal competence indices of participant skill, efficacy, and confidence predict virtual team conversational interactivity, openness, and satisfaction.

H2: The relational indices of trust, presence, and identity will add substantially to these personal competence indices in predicting virtual team conversational interactivity, openness, and satisfaction.

5.7 Method

5.7.1 Participants

The sample of 104 participants consists of seven relatively equal-size subsamples averaging 15 participants apiece. These subsamples were collected over the course of a year from three universities: an eastern US university, a midwestern US university, and an eastern European university. The total sample comprised 47 female and 57 male participants. Participant ages range from 18 to 40, with a mean age of 21.

5.7.2 Participant Training

The participants in this study were trained to use the *Second Life*® program over a period of several weeks. After an initial introduction to the use of the program, participants were given a set of team projects to complete before being invited to participate in the survey of their *Second Life*® communication experiences. These projects involved team discussion, decision-making, problem-solving, and report-writing assignments. Each team of four or five members had a specific meeting place in *Second Life*® to carry on these activities. For their first project, team members were required to interview *Second Life*® residents about their media use and develop a single group report of their findings. From this project participants learned about standards of media use in *Second Life*®, and faced the challenges of working and writing as a virtual team. For the second project, each team joined a virtual community in *Second Life*® and, after a period of observation and interviewing, reported on the community's values, goals, and ethics. These reports provided team members the opportunity to discuss and reflect on their assumptions about the purpose of virtual communities and the communication within them. In addition, writing together as a virtual team that met and communicated in *Second Life*® required group discussion, decision making, and problem solving to synthesize the results of each individual interview and experience into a single unified team report.

5.7.3 The *Second Life*® Virtual Environment

Second Life® is the largest three-dimensional, multiuser virtual environment created by users. There are 15.5 million registered participants in *Second Life*® and 900,000 of them are active each month. These users interact in a virtual space four times the size of New York City (Flowers, Gregson, & Trigilio, 2009; Kingsley & Wankel, 2009). Within this virtual space, participants communicate through symbolic visual representations of themselves called avatars, using both public and private forms of nearly synchronous text messaging (Sherblom, 2010).

These *Second Life*® participants engage in social activities and carry on business transactions, and numerous for-profit and nonprofit organizations operate and hold meetings in *Second Life*® (Sherblom, Withers, & Leonard, 2009). Among the most prominent of these companies participating in *Second Life*® are the American Cancer Society, Coca-Cola, Crescendo Design, Kraft Foods, IBM, Pepsi, Pizza Hut, and Starwood Hotels (Sherblom & Green-Hamann, 2013). The *Second Life*® currency, known as Linden dollars, has a real-world

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exchange rate and in 2015, *Second Life*® residents earned about 60 million US dollars through their business activities (Charara, 2016).

5.7.4 Procedures

The research procedures and survey questions used in this study were approved by all three university institutional review boards. Before beginning the survey, each participant was provided with an informed consent form detailing the study. Then participants responded to the survey that appears in the appendix. This electronically distributed survey took participants approximately 20 minutes to complete and participants were provided a small monetary incentive in Linden dollars for completing the survey.

5.7.5 Measures

Survey scales measure self-perceptions of skill, efficacy, confidence, trust, presence, identity, interactivity, openness, and satisfaction. Questions about participant biological sex and age appear at the end of the survey. Each measure consists of a series of statements to which participants respond on a five-point Likert-type scale. Response choices range from 1 = strongly agree to 5 = strongly disagree. Several items are reverse coded to reduce the likelihood of response-set bias.

Skill is measured using nine items. These items assess a participant's ability to engage in turn-taking, prioritize conversational responses, be articulate and expressive, display appropriate emphasis, and engage in a clear communication style. A Cronbach's alpha coefficient ($\alpha = .85$) shows an acceptable reliability for this measure.

Efficacy is measured with seven items. These items examine the extent to which respondents feel able to accomplish tasks, be productive, and be efficient in communicating with team members in *Second Life*®. Scales ask how much they use, rely on, and how useful they find this communication medium. A Cronbach's alpha coefficient ($\alpha = .79$) shows acceptable reliability for the efficacy measure.

Confidence is measured using five items. These items ask respondents to reflect on how capable, confident, knowledgeable, or nervous (reverse-coded) they feel, and how quickly they developed their ability in using this communication medium. A Cronbach's alpha coefficient ($\alpha = .81$) demonstrates acceptable reliability for confidence.

Trust is measured with seven items. These items ask participants how they present themselves to others, get to know others, and how much they trust

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others to be responsible, produce high-quality work, meet deadlines, and participate as productive team members. A Cronbach's alpha coefficient ($\alpha = .81$) demonstrates an acceptable reliability for trust.

Presence is measured using fourteen items. These ask how connected, immersed, and close participants feel to others when communicating through this medium. A Cronbach's alpha coefficient ($\alpha = .91$) shows an acceptable reliability for presence.

Identity is measured with seven items. These items ask about whether a participant's avatar looks, acts, and represents the participant adequately, and whether the participant feels able to make a true representation of self in *Second Life*.® A Cronbach's alpha coefficient ($\alpha = .84$) shows an acceptable reliability for identity.

Interactivity is measured using fourteen items. These items ask about the flow of the conversation, equality of participation among team members, ability to keep up with and follow the conversation, smoothness of turn-taking, and perceived willingness of other participants to respond quickly with relevant and on-topic contributions. A Cronbach's alpha coefficient ($\alpha = .91$) provides an acceptable reliability for interactivity.

Openness is measured using ten items. These items ask about whether participants feel like they are able to openly share their thoughts, feelings, ideas, and opinions; say what they really think and feel; and comment honestly on the ideas of others. A Cronbach's alpha coefficient ($\alpha = .80$) reveals an acceptable reliability for openness.

Satisfaction is measured with thirteen items. These items ask whether participants get what they want out of team interactions, achieve their goals, are able to express their ideas clearly, understand what others say, enjoy their interactions, believe their communication is effective, and feel good about their conversations. They also ask whether participants feel like they get to know people, can make friends easily, are pleased with their encounters, and are generally satisfied with their communication in this medium. A Cronbach's alpha coefficient ($\alpha = .94$) demonstrates an acceptable reliability for satisfaction.

5.7.6 Statistical Analyses

Three types of statistical analyses describe the relationships among these measures. Correlations describe the relationships among them. Regression analysis compares the influence of personal skill, efficacy, and confidence on team conversational interactivity, openness, and satisfaction found in the present study to the earlier results reported by Sherblom et al. (2013), who found that the personal competence measures of knowledge, skill, motivation, and lack of

apprehension affect virtual team communication. Finally, structural equation modeling produces two path analysis models that provide tests of the research hypotheses. These two path analysis models more fully delineate the multiple direct and mediated regression relationships among personal skill, efficacy, and confidence, and of relational trust, presence, and identity, as influences on team conversational interactivity, openness, and satisfaction (Hayes, 2009).

The first path analysis model shows the influence of personal skill, efficacy, and confidence on team interactivity, openness, and satisfaction. The second path analysis model adds the relational attributes of trust, presence, and identity to the model along with these personal competence measures. To show an adequate fit to the data, a model must produce a nonsignificant χ^2 and a χ^2 to *df* ratio that is less than 5 (Marsh & Hocevar, 1985). In addition, an incremental fit measure such as the comparative fit index (*CFI*), which is relatively insensitive to model complexity, and a measure of absolute fit, such as the root mean square error of approximation (*RMSEA*), can be used to test and demonstrate an adequate model fit (Hair et al., 2006). The *CFI* is normed so that values closer to 1 indicate a better fit (Bentler & Bonett, 1980). A *CFI* value of .95 or greater indicates a model that has a good fit (Hayes, Slater, & Snyder, 2008). The *RMSEA*, with a built-in parsimony index that corrects for sample size and model complexity, provides an index of how well a model fits the population as well as the sample (Hair et al., 2006). An *RMSEA* value of .06 or less indicates a good model fit (Hayes et al., 2008).

In sum, a nonsignificant χ^2, χ^2 to degrees of freedom ratio of less than 5, *CFI* value of .95 or greater, and *RMSEA* of less than .06 indicate a good model fit (Hayes et al., 2008). See Tabachnick and Fidell (2013) for a fuller description of these indices and model fit criteria. In developing the path analysis model, weak links, that is, links producing a β value of less than .10, are dropped to produce a more parsimonious model. The examination of each model's fit statistics offers a good comparison for showing if the relational attributes of trust, presence, and identity provide a substantial contribution in addition to the personal skill, efficacy, and confidence effects on virtual team conversational interactivity, openness, and satisfaction.

5.8 Results and Discussion

Table 5.1 shows that skill has a weak correlation with efficacy ($r = .19$) and a moderate correlation with confidence ($r = .52$). Efficacy presents a weak correlation with confidence as well ($r = .15$). Trust has moderate correlations with both presence ($r = .53$) and identity ($r = .38$), and presence is moderately

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Table 5.1 *Correlations*

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Skill	1	.19	.52*	.46*	.52*	.34*	.50*	.50*	.57*
2. Efficacy	.19	1	.15	.19	.40*	.36*	.35*	.30*	.43*
3. Confidence	.52*	.15	1	.20*	.26*	.22*	.19	.33*	.47*
4. Trust	.46*	.19	.20*	1	.53*	.38*	.62*	.55*	.38*
5. Presence	.52*	.40*	.26*	.53*	1	.64*	.53*	.55*	.60*
6. Identity	.34*	.36*	.22*	.38*	.64*	1	.40*	.52*	.50*
7. Interactivity	.50*	.35*	.19*	.62*	.53*	.40*	1	.64*	.48*
8. Openness	.50*	.30*	.33*	.55*	.55*	.52*	.64*	1	.55*
9. Satisfaction	.57*	.43*	.47*	.38*	.60*	.50*	.48*	.55*	1

$N = 104$; * $p < .05$.

correlated with identity ($r = .64$). Interactivity is moderately correlated with both openness ($r = .64$) and satisfaction ($r = .48$), and openness is moderately correlated with satisfaction ($r = .55$). These correlations show that the measures are moderately correlated, but that each indexes a unique attribute.

Hypothesis 1 states the expectation that participant skill, efficacy, and confidence, as indices of personal competence, will predict virtual team conversational norms of interactivity, openness, and satisfaction. The linear regression analysis demonstrates that skill, efficacy, and confidence do combine to account for 33% of the variance in interactivity ($r^2 = .33$), 29% of the variance in openness ($r^2 = .29$), and 46% of the variance in satisfaction ($r^2 = .46$). These findings are similar to and corroborate the results reported by Sherblom et al. (2013). They found that the personal competence measures of knowledge, skill, motivation, and lack of apprehension accounted for 24% ($r^2 = .24$) of the variance in their virtual team communication.

Figure 5.1 provides a path analysis model that more carefully delineates these personal competence influences of skill, efficacy, and confidence on the virtual team conversational participation norms of interactivity, openness, and satisfaction. The model shows that skill predicts interactivity ($\beta = .46$) and satisfaction ($\beta = .33$). Efficacy predicts interactivity ($\beta = .27$) and satisfaction ($\beta = .31$). Confidence predicts openness ($\beta = .26$) and satisfaction ($\beta = .32$). In addition, interactivity also affects openness ($\beta = .54$).

Similar to the linear regression results, this model shows that the personal competence indices of skill and efficacy combine to account for a substantial amount of the variance in interactivity ($r^2 = .32$). Confidence, along with interactivity, accounts for variance in openness ($r^2 = .44$), and all three indices combine to predict satisfaction ($r^2 = .48$). This model, however, demonstrates

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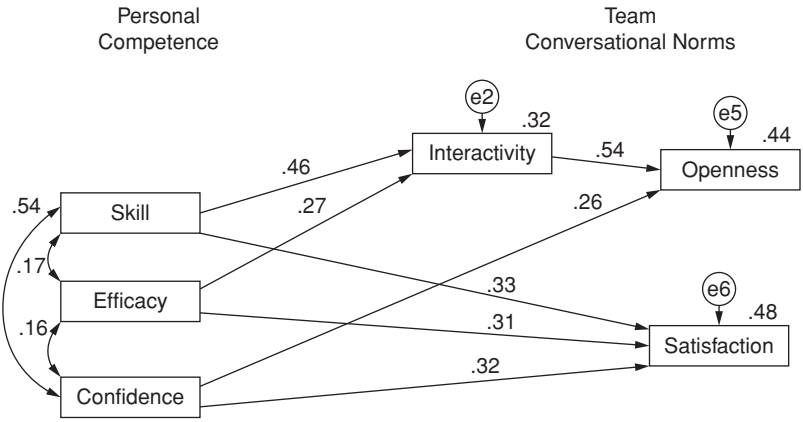

Figure 5.1 Model of personal competence influences on team conversational norms, with no relational attributes included. $\chi^2 = 14.32$; $df = 5$; $p = .014$; χ^2/df ratio = 2.84; $CFI = .82$; $RMSEA = .13$.

a relatively poor fit to the data. This poor fit is shown in the fit indices: $\chi^2 = 14.32$; $df = 5$; $p = .014$; χ^2/df ratio = 2.84; $CFI = .82$; $RMSEA = .13$. This relatively poor fit suggests that there are other predictors of these team conversational norms that are not recognized in this model. Hypothesis 2 predicts that the relational attributes of trust, presence, and identity will add substantially to the personal competence measures modelled in this first figure.

Figure 5.2 shows a path analysis model that includes these relational attributes of trust, presence, and identity as predictors of interactivity, openness, and satisfaction. The model fit indices of $\chi^2 = 10.11$; $df = 15$; $p = .813$; χ^2/df ratio = .67; $CFI = .99$; $RMSEA = .01$ demonstrate that this model provides a good fit to the data. The χ^2 value is nonsignificant, χ^2/df ratio is less than 5, *CFI* is greater than .95, and *RMSEA* is less than .06. Each of these indices indicates a good model fit.

This model also shows that skill, efficacy, and confidence have both direct and indirect mediated effects on interactivity, openness, and satisfaction. Skill directly affects interactivity ($\beta = .22$) and satisfaction ($\beta = .22$). Efficacy influences satisfaction ($\beta = .22$). Confidence affects openness ($\beta = .17$) and satisfaction ($\beta = .22$). These effects show that the development of personal competence directly predict team conversational interactivity, openness, and satisfaction.

In addition, skill affects the relational attributes of trust ($\beta = .25$) and presence ($\beta = .46$). Trust affects openness ($\beta = .19$) and interactivity ($\beta = .42$), indicating that skill has an additional mediated effect, through trust, on team

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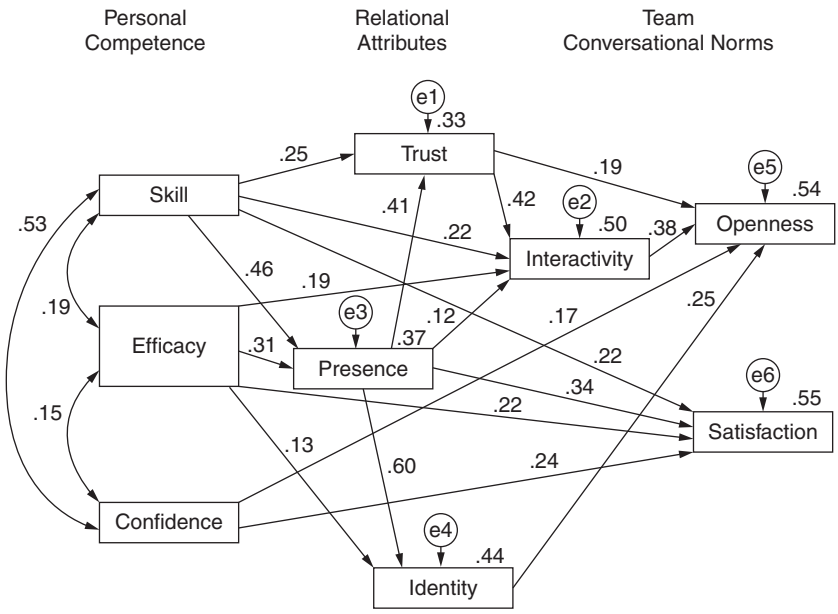

Figure 5.2 Model of personal competence and relational attribute influences on team conversational norms. $\chi^2 = 10.11$; $df = 15$; $p = .813$; χ^2/df ratio $= .67$; $CFI = .99$; $RMSEA = .01$.

interactivity and openness. Efficacy shows an additional mediated connection to interactivity and satisfaction through presence ($\beta = .31$). Presence is associated with both interactivity ($\beta = .12$) and satisfaction ($\beta = .34$). Efficacy shows a mediated association with openness through its connection with identity ($\beta = .13$), as well. Identity ($\beta = .25$) and interactivity ($\beta = .38$) are both associated with greater openness, as well.

This second model, which includes trust, presence, and identity, provides a much fuller picture and more complex description of the influences on team conversational norms. This model shows the direct and mediated relationships of personal skill, efficacy, and confidence, and the additional contributions of relational trust, presence, and identity to developing team conversational norms of interactivity, openness, and satisfaction. Including the relational attributes of trust, presence, and identity in this model not only provides a substantially better fit to the data, but also increases the amount of variance accounted in the team conversational norms.

Skill and presence combine to account for 33% of the variance in trust ($r^2 = .33$). Skill, efficacy, presence, and trust account for 50% of the variance in interactivity ($r^2 = .50$). Skill, efficacy, confidence, and presence account for 55% of

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Table 5.2 *Model Fit Criteria Comparison*

Criteria:	χ^2	*df*	*p* of χ^2 > .05	χ^2/ *df* ratio < 5	*CFI* > .95	*RMSEA* < .06
Model (no relational attributes)	14.32	5	.02	2.84	.82	.13
Model (with relational attributes)	10.11	15	.81	.67	.99	.01

the variance in satisfaction ($r^2 = .55$). Confidence, trust, interactivity, and identity account for 54% of the variance in openness ($r^2 = .54$). That is, when the relational attributes are included in the model the variance accounted for in interactivity increases from 32% to 50%, in openness from 44% to 54%, and in satisfaction from 48% to 55%.

The superior fit and increased variance accounted for by this model shown in Figure 5.2 provide support for hypothesis 2. The relational attributes add substantially to the measures of personal competence in predicting virtual team conversational interactivity, openness, and satisfaction. Table 5.2 shows a comparison of the fit statistics for the two path analysis models. This comparison demonstrates that the model that includes the relational attributes of trust, presence, and identity provides a better fit to the data and a fuller picture of the relationships than the model that includes only the measures of personal competence.

In addition, a comparison of the residual correlation matrices associated with the two models shows a significant difference, $\chi^2 = 410.03$; $df = 42$; $p < .001$. The model that includes the relational attributes contains a smaller set of residual correlations ($M = .0008$, SD = .09) than the model without the relational attributes ($M = .032$, SD = .14). This indicates that the model containing the relational attributes of trust, presence, and identity does a better job explaining the observed relationships than the model containing no relational attributes. That is, including the relational attributes leaves less unaccounted correlations in the residual matrix (Anderson & Williams, 1992; Veit & Ware, 1983).

5.9 Conclusion

The literature review highlights two potential influences on virtual team communication. The first influence is each individual's ability to communicate competently within the medium. We measured this personal competence through indices of skill, efficacy, and confidence in the using the communication medium. Recent literature indicates that differences in the relational attributes

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of trust, presence, and identity also affect the virtual team communication. Our path analysis models examine and compare these two types of influences on virtual team conversational norms. Results of this comparison indicate that the relational attributes of trust, presence, and identity are associated with personal competence as measured in skill, efficacy, and competence, and contribute substantially to team conversational interactivity, openness, and satisfaction.

Virtual teams establish and enforce conversational norms of interactivity, openness, and satisfaction as they work together. The present results indicate that having team members who are competent in communicating in a virtual environment is necessary but not adequate to achieve effective norms of team conversational interactivity, openness, and satisfaction. To develop these norms requires relational trust, presence, and identity. Training programs designed to build effective virtual team communication should focus some attention on developing these relational attributes within the team, in addition to building the personal competence needed to use the medium. Media naturalness theory suggests that participants can develop these relational skills through mindful attention and cognitive effort.

Relational trust is built through the verbal and nonverbal communication in which one learns to trust another person and establishes that person's trust in oneself. Engaging in relational talk as well as task-oriented business, that is, offering personal information about oneself such as one's thoughts and feelings toward the project, and asking the other person for ideas and opinions can, over time, establish rapport and build relational trust. This trust-building process is not different than that engaged in by teams who meet face-to-face, but it may take longer and require more effort from virtual team members.

Presence is an ongoing dynamic process of being with the other person within the communication medium. It is built upon one's skill, efficacy, and confidence in understanding and be understood by the other person. Developing this relational presence with others through the medium comes with practice and experience, and forms the basis for an interactive, open, and satisfying task-oriented virtual team conversation.

Identity builds upon this sense of presence to define the participant's role expectations of others and of self within the group. This identity becomes an enduring attribute of a participant in the virtual team. It affects the roles a participant is given by the team, and the ones a person accepts and expects (Brandon & Hollingshead, 2004; Hollingshead, 2001). A participant's identity within the team affects conversational interactivity, openness, and satisfaction.

The model presented in Figure 5.2 shows that including these relational attributes of trust, presence, and identity provides a better model fit and a more complete description of the influences affecting a virtual team's conversational

interactivity, openness, and satisfaction. Personal skill, efficacy, and confidence are necessary, but not sufficient, to generate conversational interactivity, openness, and satisfaction in a virtual team. In addition, team members must be able to form relationships that exhibit trust, presence, and identity with each other. These relational attributes of trust, presence, and identity build upon the personal competence influences of skill, efficacy, and confidence to affect the interactivity, openness, and satisfaction norms of the virtual team.

The present study shows the relationship between these relational attributes and a virtual team's conversational interactivity, openness, and satisfaction. A virtual team's conversational interactivity, openness, and satisfaction are associated with these relational attributes. Without relational trust, presence, and identity even team members who possess personal competence with the medium will have difficulty engaging in interactive, open, and satisfying conversations in a virtual environment.

Appendix: Communication in *Second Life*® Survey

Presence

1. I feel a bond with my avatar.
2. I feel connected with my avatar.
3. I feel immersed in the virtual world of *Second Life*.
4. I feel like I'm actually there in *Second Life*.
5. I feel like I'm a real person in *Second Life*.
6. I feel like the things that happen to my avatar are happening to me.
7. When people get too close to my avatar, I feel uncomfortable.
8. Someone bumping my avatar invades my personal space.
9. When my avatar falls and hits the ground, I feel it.
10. I don't notice the computer when I'm in the virtual space.
11. I often forget that there's a computer between me and others in *Second Life*.
12. The people I meet in *Second Life* seem real to me.
13. I feel connected to the people I meet in *Second Life*.
14. I feel like I'm actually in the virtual world with others.

Interactivity

15. There's a smooth flow of conversation.
16. The other members of my group are responsive in conversation.
17. People participate often in the conversation.
18. People participate equally in the conversation.

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19. Someone reading the text of our group chat would be able to follow the conversation.
20. There's a lot of turn-taking in our conversation.
21. Taking turns is a smooth process in our conversation.
22. We reach a common understanding through our group discussion.
23. We come together as a team through our group discussion.
24. Through our conversation we stimulate new ideas.
25. Everyone is quick to jump into the conversation.
26. People respond quickly to my posts in the conversation.
27. Posts are on-topic with the rest of the conversation.
28. Posts are relevant to the ongoing conversation.

Identity

29. *Second Life* allows me to present my true self.
30. It's easy for me to deceive others about myself in *Second Life*. (reverse-coded)
31. My avatar looks like me.
32. My avatar acts like me.
33. My avatar accurately represents who I am.
34. My avatar represents the real me.
35. I can be my true self in *Second Life*.
36. *Second Life* gives me the opportunity to show who I really am.

Trust

37. I feel like I get to know others' real selves.
38. I am concerned that others can deceive me easily in *Second Life*. (reverse-coded)
39. I trust how others present themselves in *Second Life*.
40. I trust others to be responsible for their tasks in *Second Life*.
41. I believe that others will be responsible for doing their share of the work.
42. I trust that my group members will produce high-quality work.
43. I trust others will meet their deadlines.
44. I am confident that I can count on my group members.

Openness

45. I can openly express my feelings in *Second Life*.
46. I can share my feelings in conversations in *Second Life*.

47. I am comfortable sharing my thoughts with others in *Second Life*.
48. My team members express their ideas openly in *Second Life*.
49. I am willing to comment on others' ideas in *Second Life*.
50. I share my opinions with my group members.
51. My group members are supportive of each other's ideas.
52. I don't worry about offending group members with my comments.
53. I can say what I really think to my group members.
54. I tell my group how I really feel.

Confidence

55. I am capable of using *Second Life*.
56. I am confident in my ability to use *Second Life*.
57. I am nervous about my ability to use *Second Life*. (reverse-coded)
58. I quickly figured out how to use *Second Life*.
59. I know I can use *Second Life*.

Skill

60. I manage turn-taking in *Second Life* skillfully.
61. I am skilled in timing my responses to people who chat with me in *Second Life*.
62. I am skilled at prioritizing responses in my *Second Life* chat.
63. I am articulate and vivid in my *Second Life* messages.
64. I am expressive in *Second Life* conversations.
65. I display certainty in the way I write *Second Life* messages.
66. My objectives are emphasized in my *Second Life* messages.
67. My *Second Life* messages are written in a clear style.
68. I am skillful in revealing composure in *Second Life*.

Efficacy

69. I accomplish a tremendous amount in *Second Life*.
70. My *Second Life* interactions are more productive than face-to-face.
71. I am more efficient using *Second Life* than other forms of communication.
72. *Second Life* is a tremendous time saver.
73. I rely heavily on *Second Life* to communicate with my group.
74. I use *Second Life* for all of my communication with my group.
75. *Second Life* is very useful for group communication.

Satisfaction

76. I get what I want out of interactions in *Second Life*.
77. I achieve my goals in *Second Life* interactions.
78. My *Second Life* interactions are effective.
79. I get my ideas across clearly in conversations in *Second Life*.
80. I feel understood when I interact with others in *Second Life*.
81. I am generally satisfied with my *Second Life* communication encounters.
82. I enjoy my interactions in *Second Life*.
83. I feel good about my conversations in *Second Life*.
84. I am generally pleased with my *Second Life* interactions.
85. When I engage others in conversation in *Second Life*, they like me.
86. In *Second Life* conversation, people like to get to know me.
87. I make friends easily in *Second Life*.
88. People enjoy my company when interacting with me in *Second Life*.

Age: _____ years
Biological Sex: ___ Male ___Female ___Other: _____

Survey responses are available from the first author by contacting: john@maine.edu.

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