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Explaining Implicit and Explicit Affective Linkages in IT Teams: Facial Recognition, Emotional Intelligence, and Affective Tone

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by

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Abstract

Over 80 percent of task work in organizations is performed by teams. Most teams operate in a more fluid, dynamic, and complex environment than in the past. As a result, a growing body of research is beginning to focus on how teams' emotional well-being can benefit the effectiveness of workplace team efforts. These teams are required to be adaptive, to operate in ill-structured environments, and to rely on technology more than ever before. However, teams have become so ubiquitous that many organizations and managers take them for granted and assume they will be effective and productive. Because of the increased use of team work and the lack of sufficient organizational and managerial sufficient best practices for teams, more research is required. Team Emotional Intelligence (TEI) is a collective skill that has been shown to benefit team performance. However, measures for TEI are relatively new and have not been widely studied. Results show TEI is a viable skill that affects performance in IT teams. In technology-rich environments, the teams' coordination can vary on levels of the expertise needed when TEI behaviors are employed. Cooperative norms play an important role in team interactions and influence TEI. Physiological measures of team emotional contagion and TEI, as well as psychometric measures of team affective tone results show causal affective linkages in the emotional convergence model. These results suggest that combined physiological and psychometric measures of team emotion behavior provide explanatory power for these linkages in teams during IS technology system use. These findings offer new insights into the emotional states of IS teams that may advance the understanding team behaviors for improved performance outcomes and contribute to the NeuroIS literature.

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Dedication

I dedicate my dissertation to the ancestors who have gone before me, my family, dear friends, and village warriors who have supported me through the entire journey. The journey to the PhD was a vision in my spirit that became reality. All great achievement requires time and commitment. The experiences have made me stronger and helped to shape who I am. I may have been born at night but not last night. The “fat lady” has sung.

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I. Introduction

Over 80 percent of task work in organizations is performed by teams (ASQC, 1993). Most teams operate in a more fluid, dynamic, and complex environment than in the past. As a result, a growing body of research is beginning to focus on how teams' emotional well-being can benefit the effectiveness of workplace team efforts. "Teaming calls for developing both affective (feeling) and cognitive (thinking) skills" (Edmondson, 2012, p. 33). Individuals in teams are required to demonstrate emotional agility and not allow divergent behaviors to take away important cognitive resources that could be put to better use (i.e., David & Congleton, 2013). Recent research shows that "strategic thought entails at least as much emotional intelligence as it does IQ" (Gilkey, Caceda, & Kilts, 2010, p.20). Nonetheless, teams have become so ubiquitous that many organizations and managers take them for granted and assume they will be effective and productive.

Today's business globalization and the "age of hyperspecialization" (Malone, Laubacher, & Johns, 2011) has influenced Information Technology (IT) teams where their task work has become more cross-functional and knowledge-intensive. The phenomenon of hyperspecialization was coined to describe what happens in technology driven organizations when work previously done by one person is done by several people. As the division of labor takes place, teams are forced to accelerate their task work to meet the rapidly changing demands and challenge of the IT task work. Teams are required to be adaptive, to operate in ill-structured environments, and to rely on IT more. In these technical environments team interactions emerge from collaboration and coordinated social interactions at the team level (Gorman, Cooke, &

Salas, 2010). Because of the increased use of team work and the lack of organizational and managerial sufficient best practices for IT teams, more research is required.

Team Emotional Intelligence (TEI) is a collective, cognitive skill that has been shown to benefit team performance. However, measures for TEI are relatively new and have not been widely studied. In particular, TEI and Information Technology (IT) teams' research is scant. Team members' emotions are shared and combined through explicit and implicit processes to form the team emotion. Because the implicit processes occur rapidly and largely unconsciously, self-reports are poorly suited for measuring them. Physiological measures can offer a way to assess team emotion and the automatic emotion processes that emerge in teams where results are less biased and more objective.

The role of emotion in IT team task work is gaining interest among scholars. Team researchers have called for more accurate and expanded measures of team behaviors given the dynamic and complex nature of team interactions. IT teams are challenged with increasing interdependence, changing composition, diverse technologies, and ill-defined boundaries where measurement techniques and approaches need to be expanded. Scholars have recommended approaches and techniques that allow identification and differentiation of basic patterns of team interactions in relevant relational aspects, task work, and knowledge structures to model dynamic changes across multiple levels of the organization. The dissertation seeks to advance the understanding of the team dynamics through comparing TEI psychometric measures, empirical evaluation of team boundary conditions, and the capture of physiological data to measure team behavior.

This dissertation examines the role of implicit (emotional contagion), explicit (affective tone), and affective composition (TEI) emotion measures and how these constructs influence

team outcomes. The first essay is an in-depth review of the TEI literature to compare existing team-level emotional intelligence measures. The objective of Essay one is to identify "missing" aspects of team behavior and to understand TEI behavior patterns that can better model TEI that may have greater explanatory power. This research advances the use of TEI measures in IT teams to identify opportunities for improved IT team performance and collaboration.

The second essay extends and validates self-report TEI measures of emotion awareness and management, including team cooperative norms as antecedents of TEI, and tests team boundary conditions in a nomological net where team performance is the dependent variable. The extent of the teams' boundary condition behaviors are examined through the moderators: intra-team conflict and expertise coordination to explain team behaviors is examined. A moderated-mediation statistical analysis is utilized to examine the constructs and relationships of interest.

The final essay builds on the second essay using physiological and self-report measures to examine how teams' implicit and explicit emotion processes, cooperative team norms, and their TEI combine to form team performance and effectiveness. Information systems such as Enterprise Resource Planning (ERP) technology provide a rich context in which to study team behaviors. ERP systems are integrated functional systems where the task work is likely structured and performed in teams. This study examines the effect of team emotions on ERP problem-solving tasks of varying difficulty level in an experimental design. A simulated ERP environment is utilized where teams are organized to perform problem-solving and decision making tasks to operate their own profit-driven fictional company (Léger, 2006). The focus of this essay is to determine whether implicit and explicit measures of team emotion provide a more complete explanation of team performance and effectiveness given an ERP problem task. This

study employs implicit measures of team emotions and emotion- sharing processes captured from electrodermal activity (skin conductance) and electronic facial emotion technology.

The final chapter summarizes findings, examines their theoretical and practical implications, and identifies promising directions for ongoing research on how the management of emotional processes may enhance team performance.

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II. A Comparative Review: Team Emotional Intelligence Measures for IT Teams

Introduction

In today's technology organizations, team is the organizational unit most often utilized for IT work. IT is a platform that enables organizations to integrate and coordinate their business processes. IT provides information systems that are central to the organization where information can be shared across all functional areas and management hierarchy. IT is an enabler of business processes and transforms the landscape of task work within organizations (Peppard, Ward, & Daniel, 2007; Bradley, Pratt, Byrd, & Simmons, 2011). Today, a large number of firms use IT systems to manage their entire value chain and operational activities. According to Gartner Group (2014), worldwide IT spending is projected to total $3.8 trillion in 2014, a 3.1 percent increase from 2013 spending of $3.7 trillion. In 2013, the market experienced flat growth, growing 0.4 percent year over year.

With anticipation of only incremental increases of IT spending, firms are forced to seek value from their IT systems in other ways to increase productivity. Most large enterprise technology systems integrate the entire functions of operating a company. Thus, the skills and abilities of technology professionals are critical to the success of work performed on a daily basis. The nature of the IT task work requires coordinated, cross-functional effort and interaction. To complete tasks, individuals must be able to work in organized teams to share knowledge and obtain results for a common goal. Therefore, increased focus on value from the IT workforce and their organizational units (e.g. teams) can be of great benefit to firms.

The design and complexity of an IT system is vast and comprehensive. Thus, the skill, knowledge, and use of these types of systems at best can be challenging for teamwork.

Integration and coordination across the enterprise is critical for effective and efficient IT use. Typically individuals form teams, and interact with each other across the organization's various functional areas to complete task work. Numerous studies indicate that more than 80% of organizations with more than 100 employees utilize some type of team in their workplace (Guzzo & Shea, 1992; Cohen & Bailey, 1997).

Companies value and need the capability of their teams (Salas, Cooke, & Gorman, 2010) and are challenged to create high-performance teams that working well together (Laszlo, Laszlo, & Johnsen, 2009). Therefore, the collective contributions (teamwork) of individuals to perform the work are considered paramount for companies to reach their goals. In an effort to enhance their ability to leverage the IT knowledge resources embedded in their employees, organizations seek ways to enhance collaboration through specialized training, talent acquisition, and technology investments,.

Common tasks of IT teams include developing application software, managing network security, implementing new software applications, and undertaking a variety of other technology-supported initiatives. Early in the formation of the teams, cooperation may be dictated by the characteristics of task work, but more typically it is dictated by teams' objectives and the means of accomplishing those objectives (Hackman, 1992). As teams begin to interact, their cooperative behaviors emerge as norms, which govern the acceptable and unacceptable behavior through interaction among team members and are mutually agreed on by the team members (Cialdini & Trost, 1998). The norms help guide the collaborative task work and exert a powerful form of social and emotional control that can influence their team performance (e.g. Taggar & Ellis, 2007). In environments of task work interdependence, such as IT task work, the

absence of strong cooperative norms supporting task accomplishment can detract from the teams' effectiveness and efficiency.

Emotional Intelligence (EI) has emerged as a promising skill that enables the processing of emotions to guide an individual's thinking and actions (Panju, 2008). This skill emphasizes a set of competencies that enable engagement in sophisticated information processing about emotion and emotion-relevant stimuli that can be used as a guide for thinking and behavior (Mayer, Salovey, & Caruso, 2008). Researchers of EI have established that it is a very important catalyst for improved job productivity and leadership skills (Bradberry & Greaves, 2005). Being aware of one's own feelings and behaviors as well as those of others can have an effect on the performance of an individual, team, or organization (Hughes & Terrell, 2007). EI is a human ability and type of social cognitive skill that can improve productivity outcomes in the workplace (Hughes & Terrell, 2007). One seasoned IT manager describes EI as a "sign of leadership and the ability to be a team player – that's the type of worker most IT managers want" (Lorenz, 2011). Yet, only a few scholars (e.g. Zachary, Bell & Ryder, 2009; Côté, 2007; Elfenbein, 2006; Jordan & Troth, 2004) have empirically examined EI as a collective, rather than and individual behavior.

EI is defined as the ability to effectively manage one's emotions (Goleman, 1995), distinct from intellectual intelligence. Goleman, while not the first scholar to research EI, is one credited with bringing popular attention to the benefit and importance of EI in the workplace. Many of Goleman's initial claims were anecdotal and focused mainly on individual success. In book Emotional Intelligence (1995) asserted that intellectual intelligence (IQ) contributes towards 20% towards life success which the remaining 80% can be attributed to emotional intelligence. While these inferences were seductive, they were not without dispute. Several

scholars refuted Goleman's claim citing a lack of systematic and empirical tests to determine an individual's success (Eysenck, 2000; Petrides & Furnham, 2000; Landy, 2005; Locke, 2005). Eysenck (2000) further criticized Goleman's loose definition of emotional intelligence. Petrides & Furnham (2000) argued that a distinction exists between the ability-based model and a trait based model of EI. Their position advances Trait EI (or emotional self-efficacy) as self-perceptions concerning the lower level of individual personality hierarchies different than ability-based EI (cognitive-emotion ability) which concerns the ability to perceive, express, and emotion in thought, understand and reason with emotion, and regulate emotion in the self and others. Thus, their view suggests EI should be studied in a personality framework. Similarly, Locke (2005) claims that the concept of EI is a misinterpretation of the intelligence construct, and offers an alternative interpretation. This claim considers EI as the ability to grasp abstractions that are applied to a particular life domain through emotions and suggests the concept should be re-labeled and referred to as a skill. Landy (2005) assert that the reason why some studies have found a small increase in predictive validity is due methodological concerns, namely, that alternative explanations have not been completely considered. Though scholarly criticism prevailed, Goleman's EI conceptualization has been popularized within management literature where many empirical many studies have been done to advance the understanding of EI and its impact on individuals and groups (Druskat & Wolff, 2001; Moriarty & Buckley, 2003; Côté & Miners, 2006; Barczak, Lassk, & Mulki, 2010; Farh, Seo, & Tesluk, 2012; Troth, Jordan, Lawrence, & Tse, 2012).

With increased research, the conceptualization of EI has continued to evolve and include the dimension of social intelligence; the social interaction among individuals demonstrates the ability to manage one's own emotions. Salovey & Mayer (1990) suggest that characteristics

associated with emotional and social intelligence represent interrelated components of the same construct. Therefore, a complete definition of EI includes both emotional and social aspects of behavior. While much has been learned about EI in the past two decades, debate continues about the definition and measurement of EI as an independent construct (Cherniss, 2010).

One might assume that if EI results in positive performance at the individual level, that EI would enhance performance at the team level. Therefore, it is reasonable to expect an emotionally intelligent team to have healthy and effective emotional dynamics and to use emotion productively in IT use. Studies have shown effective performance of teams is positively correlated with the level of cooperation and collaboration among team members (Marks, Mathieu, & Zaccaro, 2001). When teams experience high cooperation and collaboration, three key beliefs emerge: a) mutual trust among members, b) group identity (a feeling among members of inclusiveness and attachment to the group), and c) group efficacy (a feeling among members that the team can perform well and be successful). Together, the presence these factors facilitates team cooperation and collaboration (Druskat & Wolff, 2001). Elfenbein (2006) suggests teams may be more effective in the workplace when there is greater EI within the team and where each team member is an individual resource that each person uses in his or her interactions with others.

Most EI psychometric scales that are designed to measure EI behavior ignore the role of context (Cherniss, 2010). This is problematic since, social psychologists have suggested that behavior can vary enormously depending on the situation and setting (Gergen, 1973; Allport, 1985; Cialdini, & Trost, 1998). Therefore, while it is reasonable to assume that EI is influenced by context, few instruments measure team-level emotional intelligence and none specifically

have measured TEI within the context of IT teams. The purpose of this research is to inform researchers and practitioners about EI assessments applicable for IT organizational teams.

This paper seeks to provide 1) a theoretical review of the TEI construct 2) a summary of how teams develop, 2) a comparative analysis of TEI psychometric measures, and 3) a perspective on strengthening TEI measures for IT team performance and collaboration. The paper proceeds as follows: the literature review section presents an overview of TEI, the context of TEI for IT teams, how teams develop, and prior literature about TEI and performance; the next section compares and contrasts the various psychometric measures that have been used to examine TEI and performance and finally, conclusions, key observations, and implications for future research are offered.

Importance of EI in the IT workplace

A recent survey published by CareerBuilder investigated the topic of "where EI matters the most" across various industries (Lorenz, 2011). The results in the area of IT outcomes provide strong evidence for the importance of EI in the workplace. Their results for the IT area are as follows:

- 37 percent of IT employers said they are placing a greater emphasis on high emotional intelligence for hiring and promotion decisions post-recession
- 52 percent value emotional intelligence in their employees more than IQ
- 55 percent would not hire someone who has a high IQ but low EI
- 61 percent said they are more likely to promote the high EI worker

In today's business, organizations are global and good teamwork has become increasingly imperative as employees with differing skillsets and ideas have been scattered on different continents. Circumstances may call for the global and enterprise-wide employees to

share information across locations in order to strategize, innovate, and bring to market a company's products or services. Therefore, EI can play a variety of important roles to help facilitate interactions of the employees with a company (Fineman, 2004; Côté & Miners, 2006; Joesph & Newman, 2010). Effective use of information technologies is an important aspect where the interactions between individuals working in teams can benefit from emotion management in the workplace (Kozlowski & Ilgen, 2006; Côté & Miners, 2006; Farh, Seo, & Tesluk, 2012).

IT workers are highly skilled and trained to address the demands of the rapid changes in technology. Technology attributes, tasks, and activities have grown more complex as information technology has changed, and thus the ability to leverage the collective skills and knowledge of individuals is important (Stein, 2009). Moreover, as organizational structures continue to flatten, there is an accelerated need for greater coordination and collaboration across teams and work groups. Prior research has shown that socio-cognitive variables predict group performance more strongly than the cognitive variables (Kelly & Barsade, 2001). This suggests that not only are knowledge, skill, and abilities important aspects of teamwork, but also that individual social and affective skills can influence performance. These skills can help team-level functioning (Tesluk, Mathieu, Zaccaro, & Marks, 1997) and teams' experiences in a particular setting (Hochschild, 1983).

Supporting the need for context-specific EI measurement (Cherniss, 2010), suggests there is a need for the reliance on more alternative EI measurement strategies and a need to develop new measures that are more context sensitive. Many existing EI measures capture individual-level perspectives and are aggregated at a team-level. In addition to the availability of assessments that measure team-level EI behaviors, many EI measures have weak content

validity, unstable factor structures, and lack empirical support for either divergent or convergent validity (Conte, 2005; Matthews, Emo, Roberts, & Zeidner, 2006). Additionally, many EI assessments use self-report measures that have internal limitations due individual biases of respondents.

Literature Review

Team Emotional Intelligence

Three primary theoretical propositions have evolved to conceptualize TEI. Druskat & Wolff (2001) define group emotional intelligence (GEI) as a competence that develops from group socialization, norm building, and developing relationships within the group. Druskat & Wolff's conceptualization is similar to the idea of "collective cognition" where the team is able to manage the awareness of one's own and others' emotions. This emotional awareness and management can assist individuals within the team in problem solving and decision making (Salovey & Mayer, 1990).

Druskat & Wolff (2001) research presented one of the early theories to explain how emotional intelligence (EI) can manifest at the group (i.e., team) level. Their theoretical views propose awareness and management of emotion in groups to improve group effectiveness by enabling a group to take advantage the positive and negative emotions experienced by members. Emphasis is placed on emergent collective emotion norms that build social capital and support group effectiveness to suggest establishing specific team norms create awareness and regulation of emotion that can lead to better team outcomes. The emotionally intelligent norms form when the attitudes and behaviors become habit within the team. Subsequently, a team-level emotional competence can emerge to benefit intra-team and cross-team boundaries within the organization.

In contrast, Salovey & Mayer (1990, 1997) posits emotional intelligence as a set of skills that contributes to the accurate appraisal and expression of emotion to facilitate thought and

understanding. These skills are manifest by the ability to regulate emotion in self and others in a given situation at the individual level. Therefore, EI is conceptualized as an ability approach that encompasses both social and cognitive intelligence which can develop over time.

Salovey & Mayer's (1990) differs from Druskat & Wolff (2001) dimensional approach of an individual's current state of emotional development verses an emergent collective emotional development in teams. Druskat & Wolff sought to address that existing theory and research did not address specific behavior enough to be useful for managerial ways to best develop and sustain effective work groups (Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995; Cohen & Bailey, 1997). While other scholars argued for an increased understanding of team dynamics and team effectiveness emphasizing roles of emotion and relationships in teams (Edmondson, 1999; George, 2002, Keyton, 1999).

The Schutte, Malouff, Hall, Haggerty, Cooper, & Golden (1998) instrument to measure EI is based on Salovey & Mayer's (1990) theory. Their instrument is a self-report 33-item comprehensive model of EI. Their measures emphasize a process oriented model that captures stages of development for potential EI growth and the emotion contributions for intellectual growth. This model differs from Salovey & Mayer's (1990) dimensional approach of an individual's current state of emotional development.

Peter Drucker (1988) widely known and influential thinker of management theory is credited with advancing that a team-based organization can be highly effective. Many emotions emanate from social interactions (Kemper, 1978) thus indicating emotion is a pervasive influence in teams and is fundamental to how teams interact and work together (Druskat & Wolff, 2001). The inherent factors of teamwork, social activity, and emotion can play an important role in team effectiveness. According to Jordan & Lawrence (2009), there are four

dimensions of TEI behavior. First, awareness of one's own (AWR) emotions is the ability to discuss and disclose one's emotions. Second, awareness of others' emotions (AWRO) is one's ability to read faces and body language. Third, management of one's own emotions (MGT) is the ability to delay or withhold strong emotional reactions. And lastly, management of others' emotions (MGTO) is the ability to positively influence others' emotions.

TEI provides a model to measure emotion process abilities that can contribute to improving social interactions. Team emotion emerges from combining "bottom up" affective composition and "top down" affective contexts (Barsade & Gibson, 2007). The affective composition effects comprise the individual level characteristics that team members bring to the team. The top-down affect interaction that happens within a team creates team phenomena and structures that serve to shape and constrain how the team regulates their emotion. The information technology can serve as the affective context. The team technology use can shape team member interactions which in turn underlie the emergence of team behaviors that may influence patterns of technology use.

Fredrickson & Joiner's (2002) perspective on simulation games and learning outcomes explain the role of positive emotions in broadening an individual's capacity to learn. They found that positive emotions enhance optimistic thinking, leading to more creative problem-solving capacities. Troth et al. (2012) examined the multi-level and cross-level behaviors of how team members' use of emotion-related skills affects task performance and communication performance within the team. Their findings suggest that team emotional awareness (own and others) skills are positively related to individual members' communication performance within a team. Team communication performance is central to a team's behavior and an important aspect of how teams work together. When teams are able to utilize their emotional pool of resources

effectively, more focus can be directed on knowledge and idea exchange. Thus, greater potential exists for the team members to engage in effective communication (Canary & Spitzberg, 1987).

IT Teams

Most teams now operate in more fluid, dynamic, and complex environments than ever before (Tannenbaum, Mathieu, Salas, & Cohen, 2012). Technology teams in most firms are organized to respond to rapid changes and most often geographically dispersed. IT companies recognize that complex problems are often best tackled by a team of people with diverse expertise and collaboration regardless of their geographic location. Thus, the IT team environment has changed and new needs have emerged.

Kozlowski & Bell (2003) characterize teams as collectives who exist to perform tasks, share common goals, interact socially, exhibit task interdependencies, and manage boundaries within the organization. The effectiveness and efficiency of team work has not kept pace with the rapid changes in technology. The team interactions and tasks are more complex requiring greater collaboration, emotional communication, and labor in their dynamic environment. Although many team-related dynamics are similar, the need to align competencies and expectations with existing technology challenges and dynamics is vital.

Each type of IT use is a change process for the individuals using the technology. Individuals typically have to adapt to the new work strategies and tasks with their organizational domains. Although industry-wide, the general perceptions are that technology initiatives improve productivity and operational efficiencies. However, well over half of the technology initiatives in organizations fail to achieve their stated goals (e.g. Galorath, 2012). The collective and individual productivity in organizations seem to depend on the effective and appropriate use of technology, however absent from these formulations is the consideration of emotional

responses to the process changes, attitudes, and behaviors. Development in organizational theory advances that events and emotions play important roles in influencing employees' attitudes and behavior (Weiss, 2002; Brockner & Higgins, 2001).

Cooperative Team Norms

Membership in a collective is tied to the adoption of norms, values, and conventions (von Scheve & Ismer, 2013). Parkinson, Fischer, & Manstead (2005) have argued that sharing of norms in a systematic manner influences emotional appraisals and contributes to emotional convergence. Emotional appraisals are the judgments that one makes in response to external stimulus or situation (Lazarus, 1991). For example, when team members who do not have a previous history meet for the first time for project work, may have emotions of apprehension, anticipation, happiness or fearfulness for a new project start-up. Their responses can be attributed to their emotional judgments associated with project task work. The emotional responses play distinctive roles in the top-down and bottom components to converge the teams' emotion. Consequently, emotional management ability arises when the norms and rules are learned for particular settings and then actively assessed and managed to be consistent with the demands of the situation. Norms identify the regular patterns of behavior and influence members' identification with a group (Chatman, 2010). Ashforth & Humphrey (1995) suggest that norms may develop for any organizational role involving interpersonal interaction. Prior research found that many of the elements of effective emotional functioning in teams came from norms that the team members developed rather than from the intelligence of the particular individuals (Druskat & Wolff, 2001). Their findings suggest that individuals who exhibit high levels of emotional intelligence were more effective fostering healthy norms for teamwork.

Team norms influence how a team's members perceive and interact with one another, approach decisions, and solve problems (Chatman & Flynn, 2001). However, having emotionally intelligent individuals within the team will not result in an "emotionally intelligent team"; team norms play an important role in building the team members' abilities to respond constructively in emotionally uncomfortable situations (Turner & Lloyd-Walker, 2008). Norms are particularly important in team settings for interdependent tasks involving coordination and harmony.

When teams act in an emotionally intelligent manner, it reflects their effective interpersonal behaviors. The teams' norms can serve as conditions for communicating cooperatively even under difficult circumstances (Elfenbein, 2006). When teams establish cooperative norms, teams place importance on personal interests and shared pursuits, shared objectives, mutual interests, and commonalties among their members (Chatman & Flynn, 2001). Early research of Bettenhausen & Murnighan (1985) suggests that team norms often form early before team members adequately understand their tasks. However, over time the team norms are subject to modification based on how team members interact and share experiences. These modifications form the basis for the norms that govern future team interactions. Hence, the highly collaborative and complex nature of IT task work is a valuable context that can benefit from a greater understanding and application of measures for team emotional intelligence.

How Teams Develop

Team members become accustomed to each-others personalities, working styles, and other interactions that influence successful team performance over a period of time. The Tuckman Theory (1965) for developing teams offers a persuasive explanation of how teams form. According to the theory, team development includes four distinct stages: 1) forming, 2)

storming, 3) norming, and 4) performing. During the *forming stage* team members are introduced to each other, team goals and objectives are communicated. During the *storming stage* can be described as the time when team members begin to realize that the task is different or more difficult than they have imagined, and interpersonal conflicts may arise in the team; therefore, this stage can be specified as the most challenging part of the team formation process. The *norming stage* relates to the time when formal and informal roles and responsibilities have been set and agreed upon within the team. After this stage, the actual team performing process has started. The p*erforming stage*, the most desirable stage, involves team members feeling positive and excited about the teamwork. Later work by Tuckman (1977) added a fifth stage when teams may also face the *adjourning* stage. This stage involves the completing of the task work and disbanding the team. Each stage characterizes the various interactions that the majority of teams experience. Anecdotally, it may be natural to assume when interactions between individuals are organized in a collective capacity, they can become disrupting and inhibit overall performance.

Team Dysfunction

The lack of harmony in teamwork within an organization can potentially generate distracting behaviors such as insecurity and mistrust, limited sharing of information or resources, purposeful non-cooperation, unproductive communication, and overall poor performance (Leenders, Engelen, & Kratzer, 2003; Kanaga & Browning 2007). For example, teamwork is especially important within the internal value chain of a company where core functions of the organization and key processes are executed. Teamwork mechanisms can make the parts of the operational activities run smoothly. While incorrect or lack of information can happen when a team member doesn't know about a planned team meeting and does not attend, the absence can

limit the team's capability and jeopardize the team's progress. Other sources of conflict may occur when team members hoard information that should be shared, stifling team performance.

Most importantly, the complex nature and advances in technology work identify the need to further develop ways in which team performance can be improved. Such improvements can be leveraged through collective abilities gained from social cognitive skills (Cherniss & Adler, 2000; Slaughter, Yu, & Koehly, 2009; Zachary et al., 2009) such as TEI. It is likely that technology would impact the emotional interaction of the team and affective consequences. The awareness and management of one's and others' emotions is an important aspect of behavior that can strengthen the interaction and collaboration to fully engage in IT task work.

Theory of Teams

Because current team research draws heavily from the work of early scholars who research group dynamics, for the purpose of this paper, the term group is analogous with the term team. An early teams' research scholar, Wilfred Ruprech Bion, an influential British psychoanalyst is considered one of the earliest pioneers studying the recurrent emotional states that influence group process dynamics. Bion's (1961) theory provides the framework to study team dynamics. The central premise of Bion's theory is that in every group, two groups exist: the "work group" and the "basic assumption group". According to Bion, the work group and the basic assumption group are factions or subgroups within the group, but rather two dimensions of behavior within the group. His primary interest was to understand why groups employ ineffective and self-contradicting behavior that lessens the effectiveness of the groups.

The work group is the dimension of group functioning that manages the primary task of the group - what the group is organized to accomplish. The work group is aware of its purpose and can define its task. Its members work cooperatively as separate and discrete members who

willingly choose to belong to the group because they identify with interests of the group. At this point, the group is mature, cohesive, knowledge-seeking, and learns from their interactions.

The term "basic assumption group" describes the tacit underlying assumptions on which the behavior of the group is based. Bion specifically identified three basic assumptions: *dependency, fight-flight, and pairing.* According to Bion, when a group adopts any one of these basic assumptions, it interferes with the task the group is attempting to accomplish. Bion believed that therapeutic intervention could ameliorate the negative effects of group assumptions.

In *dependency*, the aim of the group is to attain security through, and have its members protected by, one individual. The basic assumption in this group culture suggests that an external object exists whose function it is to provide security for the immature individual. In the basic assumption of *fight-flight*, the group behaves as though it has met to preserve itself at all costs, and that this can only be done by running away from someone or fighting someone or something. In fight, the group may be characterized by aggressiveness and hostility; in flight, the group may chit-chat, tell stories, arrive late or undertake any other activities that serve to avoid addressing the task at hand.

The final basic assumption group, *pairing*, exists on the assumption that the group has met for the purpose of reproduction - the basic assumption that two people can be together for only one purpose, that of a sexual one. Two people, regardless the sex, carry out the work of the group through their continued interaction. The remaining group members listen eagerly and attentively with a sense of relief and hopeful anticipation.

Just as no group consistently lives up to the ideal of the work group, no group functions completely at the basic assumption level. Instead, aspects of the work group and basic assumption group interplay at different times and with varying intensity. According to Bion, any

group, organization, or society needs and evolves a structure of tasks, roles, procedures, rules, and group culture in order to contain the anxiety of the unknown and the responses which unconsciously are mobilized to defend against the unknown. Thus, within the group setting, an understanding of the basic assumption and work group behaviors can shape observations which can bring hidden assumptions into awareness for critical examination. These group behavioral dimensions provide a theoretical foundation in which to draw upon for understanding group (.i.e., team) emotion and its importance in IT teams.

Ability versus Mixed Models of EI Measures

There are two widely used construct models available to define EI: a) an ability model and b) a mixed (traits with abilities) model (Mayer, Salovey, & Caruso, 2000). Ability models, originally conceptualized by Mayer et al. (2000), propose EI as a type of intelligence or aptitude which overlaps with cognitive ability. Ability models posit EI as "the ability to carry out accurate reasoning about emotions and the ability to use emotions and emotional knowledge to enhance thought" (Mayer et al., 2008, p.511). The ability based models of EI promotes understanding information processing skills and strategies can be assessed through performance tests to measure actual rather than self-perceived abilities (Lopes, Côtés, & Salovey, 2006).

In contrast to ability models, mixed EI models do not classify EI as intelligence but rather as a combination of intellect and various measures of personality and affect (Petrides & Furnham, 2001). Bar-On's (1977) mixed model defines EI as "array of noncognitive capabilities, competencies, and skills that influence one's ability to succeed in coping with environment demands and pressures (p.14). Mixed model EI measures are considered broad models of personality traits. The broader nature of the EI measure makes it harder to understand how much of the explained variance is due to EI and how much is due to other components of

the measures (e.g., Joseph & Newman, 2010). Many scholars have challenged EI mixed model measures on two key points: 1) they appear to define EI by exclusion not presented by cognitive ability (Elfenbein, 2008; Locke, 2005; Murphy, 2006, Zeidner, Matthews, & Roberts, 2004) and 2) they are a redundancy with personality traits to justify as a distinct construct (Conte, 2005; Daus & Ashkanasy, 2003: Van Rooy, Dilchert, Viswesvaran, & Ones, 2006).

As a result, some researchers conclude ability EI models are worth studying (Daus & Ashkansasy, 2005; Zeidner, Matthews, & Roberts, 2004) or that EI mixed models are flawed due to a lack of scientific rigor (Joseph & Newman, 2010). Nonetheless, an ability based EI model may well benefit IT teams whose task work is knowledge intensive and social interactions are an inherent part of their interactions (Robert, Dennis, & Ahuja, 2008). Moreover, several scholars have advanced the benefits that can be gained from situational influences on emotional intelligence (Zeidner, Matthews, & Roberts, 2004; Boyatzis, 2007; Goleman, Boyatzis, & McKee, 2002) such as in IT teams.

Prior Literature on TEI

Teams characteristically share a common goal and purpose within a company. In complex technology integrated environments, teams' boundary spanning tasks can extend the entire enterprise. Team boundary work includes acquiring information and resources and managing relationships with external stakeholders, as well as protecting team resources (including members' time and energy) from competing external demands (Ancona & Caldwell, 1992; Reagans & Zuckerman, 2001). Studies have found that team boundary spanning activities play a key role in gaining the team access to needed information across the technology enterprise (Allen, 1984; Tushman, 1977; Zmud, 1983). This recognition of common purpose and the boundary spanning can enhance the greater good of the organization and play a vital role in the

health, vitality and agility of a well-functioning company and the way knowledge is shared among teams.

In order to enhance their performance, team members need to build consensus utilizing their expertise and abilities. Smith, Collins, & Clark (2005) research demonstrated that the rate of new product and service introductions was attributed to the organizations' members' ability to combine and exchange knowledge. Kogut & Zander (1992) emphasize how new knowledge leads to the generation of novel organizational outcomes. When individuals in teams have built shared understanding and integrate into diverse knowledge bases, innovation occurs (Schulze & Hoegl, 2006; Sabherwal & Sabherwal, 2005). Thus, team collaboration and shared knowledge are important aspects within the team dynamics.

EI abilities have significant empirical results in the context of workplace interactions. Prior literature has found positive correlates between EI and job satisfaction (Grandey, 2000), job performance (Daus & Ashkansasy, 2005; Quoidbach & Hansenne, 2009), team performance (Bell, 2007; Laszlo, Laszlo, & Johnsen, 2009) and project success (Turner & Lloyd-Walker, 2008). The collective intelligence factor was found to be a much better predictor of group performance than the average or maximum individual intelligence (Woolley, Chabris, Pentland, Hashmi, & Malone, 2010). Thus, potential benefits can be gained when collective EI measures are examined at the team-level to explain performance.

In the book, *The Emotionally Intelligent Team*, Hughes & Terrell (2007) suggest "EI is the next evolution of human enterprise" and suggest that there are organizational benefits when teams display well-developed emotional intelligence. For example, teams with greater EI are happier and more creative; experience greater productivity; are able to tackle challenging tasks and complete in a manner when other teams fail; and achieve more efficient resource use with

collaborative efforts (Druskat & Wolff, 2001; Jordan & Troth, 2004; Côte & Miners, 2006; Barczak, Lassk, & Mulki, 2010). Over the last fifteen years, several scholars have developed instruments that strive to more accurately and systematically measure EI. Daniel Goleman's (1998) four-dimensional trait-based instrument assesses EI on self-awareness, self-management, social awareness, and social skills; Reuven Bar-On (1977) developed a five-dimensional trait-based assessment that measures intrapersonal aptitude, interpersonal aptitude, adaptation, stress management, and general mood. Mayer & Salovey (1997) developed an assessment that measures EI on a four-dimensional ability model that includes: emotional perception, appraisal, and expression, emotional facilitation of thinking, understanding emotions, and regulating emotions which are 1) perceiving emotion, 2)using emotion to facilitate thought, 3) understanding emotions, and 4) managing emotions. Dulewicz & Higgs's (1999) seven-dimensional trait-based model comprises self-awareness, emotional resilience, motivation, interpersonal sensitivity, influence, intuitiveness, and conscientiousness. Additional EI measures based on these models include the Emotional Competency Index (ECI-2)(Sala, 2002), the Emotional Quotient Inventory (EQ-i)(Bar-On, 1997), the Emotional Intelligence Questionnaire (EIQ)(Dulewicz and Higgs, 1999), the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT, related EQ-360 and EQ-i 2.0)(Mayer et al., 2002).

While team IT TEI measures have not existed, several general TEI measures have begun to emerge. Several scholars convey that a lack of common understanding exists along with questionable empirical analysis for the team level EI construct. TEI allows for the whole team to utilize its synergistic mechanisms to become more emotionally intelligent collectively, where the process may enhance group performance and output (Jordan & Troth, 2004; Farh, et al., 2012; Barsade & Gibson, 2007; Belohlav, Dierdorff, & Bell, 2011). This paper focuses on a critical

analysis of the existing psychometric and self-report ability measures for TEI. The intent for this research is to compare and contrast strengths, weaknesses, and differences across the TEI instruments.

Comparative EI Measures for Teams

After a comprehensive review of the literature to identify ability-based TEI measures, five instruments were found. A detailed description of each of the five instruments can be found in the Appendix. The TEI instruments that were evaluated include: 1) Workgroup Emotional Intelligence Profile (WEIP), 2) Emotionally Competent Group Norm (ECGN) Inventory, 3) Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT), 4) Schutte Emotional Intelligence Scale (SEIS), and 5) Wong and Law Emotional intelligence survey (WLEIS). Each of the five instruments was evaluated on the following criteria: 1) internal reliability, 2) construct validity, 3) predictive validity, 4) external validity, and 5) applicability for team level of analysis.

Of the five instruments that were evaluated, only three are specifically used to assess TEI. The three instruments that were identified as having a team-level focus include: WEIP versions, b) ECGN, and c) WLEIS. Largely, Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT v2), and Schutte Emotional Intelligence (SREI) provide the conceptual foundation from which each instrument is developed. The next section will review each of the five emotional intelligence instruments.

Mayer-Salovey-Curuso Emotional Intelligence Test (MSCEIT v.2)

Salovey-Mayers' (1990) work first defined EI as "the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions" (p.189). The authors acknowledge that their initial conceptualization of EI was a mixed model because it incorporated aspects of personality that might accompany emotional intelligence (Mayer et al., 2000). The items developed for the Multifactor Emotional

Intelligence Scale (MEIS), their first EI assessment served as the foundation for the development of the current MSCEIT. A few years later, the authors gradually refined their definition to argue that EI was a real intelligence versus personality aptitude. Then they offered a revised and more focused definition of EI as ability to: a) perceive emotion, b) integrate emotion to facilitate thought, c) understand emotions, and d) manage emotions (Mayer & Salovey, 1997). The MSCEIT was designed to measure the four abilities. The current MSCEIT assesses the four branches (specific skills) modeled with 141 items that are divided into four sets of tasks. Each of the four branches is measured using two tasks. Perceiving emotions is measured with the faces and pictures tasks; facilitating thought is measured with the sensations and facilitation tasks; understanding emotions is measured with blends and changes tasks; and managing emotions is measured with emotion management and emotional relationship tasks (Mayer, Salovey, Caruso, & Sitarenios, 2003). The test yields seven scores: one for each of the four concepts, two area scores, and a total EI score.

The MSCEIT has a factor structure congruent with the four-part model of EI and it is both reliable and content valid. The authors assert that the MSCEIT meets several standard criteria for a new intelligence: It is operationalized as a set of abilities; it is objective in that the answers on the test are either right or wrong as determined by consensus or expert scoring; its scores correlate with existing intelligences while also showing unique variance; and scores increase with age (Mayer, Caruso, & Salovey, 1999; Mayer et al., 2002; Mayer & Geher, 1996).

The MSCEIT test has been correlated with verbal intelligence, the Big Five, and self-reported empathy (Brackett and Mayer, 2003; Ciarrochi, Chan, & Caputi, 2000; Mayer et al., 1999; Salovey et al., 2001). Preliminary studies show that MSCEIT correlate moderately with these constructs (*r*s <.40). MSCEIT measures demonstrate discriminant and convergent validity

from measures of personality and well-being and results show it predicts important life criteria. Findings suggest that with MSCEIT, EI is a distinct mental and clearly defined construct that has evidence of incremental validity. The test-retest reliability of the full-test MSCEIT over a three-week period was $r(59)=.86$ in a college student sample (Brackett & Mayer, 2003). This test has received the most attention in terms of validity and credibility (Conte, 2005). Predictive and incremental validity have increased since its inception in 1997.

The majority of studies that used the MSCEIT test were with individual rather than group/team level analysis. This test has also shown to be related to academic performance, leadership and organizational behavior, job performance, leadership style, occupational choice, attachment style, academic success, and negatively related with problem behaviors and violence. Among all the available EI instruments, the MSCEIT is the only measure that tests emotional intelligence by comparing self-reported scores against expert and consensus opinion. This distinguishes the MSCEIT from other similar EI tests. Over 832 articles, many of which are peer reviewed, between 1997 and 2013 referenced team and MSCEIT in the text of their article. A random review of four articles show the EI score construct reliability > .88 on many dimensions. Thus, the MSCEIT EI score demonstrates sufficient validity to measure the intended behavior (Rozell & Scroggins, 2010; Farh et al., 2012; Clarke, 2010; Brackett, Mayer, & Warner, 2004).

Self-Report of Emotional Intelligence (SREI)

The Self-Report of Emotional Intelligence (SREI) was published shortly after the MSCIT test (Schutte et al., 1998) and is based on the original model of EI proposed by Salovey and Mayer (1990). Over time, the test has increased from 33 items to the current 41 items which comprise four factors: optimism/mood regulation, appraisal of emotions, utilization of emotions and social skills. The instrument has been used in a number of studies (Ciarrochi, Chan, &

Bajgar, 2001; Petrides & Furnham, 2000; Austin, Saklofske, Huang, & McKenney, 2004; Schutte et al., 2002; Chang, Sy, & Choi, 2012). Interest in this scale has been in part motivated by its relative brevity and consistent stability has been shown across several studies (Petrides & Furnham, 2000; Saklofske, Austin, & Minski, 2003; Chang et al., 2012).

While the SREI's reliability average greater than .65, and up to .77, Petrides & Furnham (2000) have criticized its psychometric properties. The SREI correlates moderately to strongly with a number of personality constructs, including alexithymia, optimism, impulse control, and openness to experience (Schutte et al., 1998). Other EI scales have significantly correlated with this measure to assess interpersonal relations, empathic perspective taking, social skills, marital satisfaction, and supervisor ratings of student counselors who worked at mental health agencies (Schutte et al., 1998; Schutte et al., 2002). Some of these findings lead researchers to best characterize this evaluation as a type of personality inventory and not measures of EI (Hedlund & Sternberg, 2000; Mayer et al., 2000). Moreover, in Van Rooy & Viswesvaran (2004) meta-analytic investigation of the SREI predictive validity, they suggest far less studies used these measures than all other measures of EI and that quantitative results show lower operational validity.

Wong and Law Emotional Intelligence Survey (WLEIS)

The WLEIS is a 16- item TEI measure. The measure includes four scales: appraisal of emotion in oneself; appraisal of others emotions; regulation of emotion in oneself; and use of emotion to facilitate performance. The item scales consists of two parts where respondents evaluate: a) 20 scenarios that best reflect their likely reaction in each scenario and b) two types of abilities that best represent their strengths. This team level measure of EI purports to measure leadership quality (Wong & Law, 2002). A closer examination of the item scales does not reveal

leadership skills which is an important aspect when interacting with others in an emotionally intelligent way (McEnrue, Groves, & Shen, 2009). In other words, WLEIS addresses the perceptions of value or excellence about EI rather than how EI knowledge influences behavior.

Wong & Law (2002) assert their measure is one of the few TEI measures developed expressly for the Asian context, yet it is consistent with Mayer & Salovey's (1997) conceptualization of EI. The authors proclaim this is primarily because the Asian culture has been depicted as failing to display overt emotions in the workplace. This is a noted limitation of the measure when EI is examined within a western culture. The WLEIS has documented high internal consistency, convergent, and discriminant validity and incremental validity, beyond personality factors, when predicting dependent variables (Wong & Law, 2002; Law, Wong, & Song, 2004; Sy, Tram, & O'Hara; 2006). Several studies have shown the reliability measures consistently above .70 in studies (Law et al., 2004; Güleryüz, Güney, Aydýn, & Alan, 2008; Hur, van den Berg, & Wilderom, 2011).

Early in the study of EI, scholars voiced strong reservations about the reliability and validity of the scales. In particular, Davies, Stankov, & Roberts (1998) argued that most of the scales had salient cross-loadings on personality dimensions. Wong & Law (2002) revised the item definition and domain of the EI construct and developed a new scale. Their new scale demonstrated the TEI measure had incremental predictive validity over general mental abilities (GMAs) and was a good predictor of job performance.

Emotionally Competent Group Norm (ECGN) Inventory

The Emotionally Competent Group Norm inventory was developed by Druskat and Wolff and later refined based on work by Hamme (2003). The TEI measures self-rated team member behavior according to the nine ECGN norms measured by the instrument. The

Emotional Competent Group norm scales comprise 57 questions, representing nine team norms. The nine scales have 5-8 questions, with one to three items in each scale reversed scored. The ECGN norms are comprised of a) interpersonal understanding, confronting members who break norms, team self-evaluation, proactive problem solving, organizational understanding, and building external relationships.

The group norms map to four overarching clusters of EI skills: self-awareness, self-management, social awareness, and relationship management (Goleman, 2001; Boyatzis, Goleman, & Rhee, 2000). The ECGN norms reflect improved group effectiveness by building social capital, which facilitates engagement in effective task behaviors and processes. Moreover, the group norms are an indication of the group's emotional intelligence and can help to determine individuals' functions as a high-performing team (Goleman, Boyatzis, & McKee, 2002). Each ECGN norms are aligned to the individual, group, or cross-boundary (external) level. Within each of the three levels is at least one norm that is an awareness norm and one that is a regulation norm. The focus of these measures is to understand the ability of a team to generate operating norms that increase awareness of motion and management of behavior in ways that have positive emotional consequence.

The instrument has now been administered to over 150 teams and provides feedback on 9 group norms that research has shown are linked to team effectiveness. Additionally, a prior study has shown that the leader's behaviors are important in the development of team norms (Koman & Wolff, 2008). The internal consistency reliabilities were assessed for each GEI scale. Each reliability measure has shown values > .67. The key aspect of this instrument is its target design to specifically measure TEI.

Workgroup Emotional Intelligence Profile (WEIP)

Jordan, Ashkanasy, Härtel, & Hooper (2002), created a measure of work group emotional intelligence based upon an earlier model of EI proposed by Salovey & Mayer (1990). The WEIP captures two dimensions of emotional intelligence: Ability to Deal with Own Emotions, and Ability to Deal with Others' Emotions. Scales 1 and 2 are delineated into 5 subscales. Scale 1 is composed of the subscales Ability to Recognize Own Emotions, Ability to Discuss Own Emotions, and Ability to Manage Own Emotions. Scale 2 is composed of the subscales Ability to Recognize Others' Emotions and Ability to Manage Others' Emotions. The WEIP is different than other instruments because (1) it is not a general EI measure, (2) all the items refer to members of the team, and (3) it assesses EI within the work team context. The strength of the WEIP measure is its focus to assess abilities as expressed as actual behavior in a specific team context and, therefore, emphasize a measure that can identify the specific abilities actually being used in the team contexts.

The TEI is measured by calculating the average scores of EI for all team members. The WEIP-3 is the basis for a short form version of WEIP which will be used in this research. The WEIP-S consists of 44 items based on the revised Mayer & Salovey (1997). The short version of WEIP-S is comprised of 16 items, 4 items for each of the four emotional abilities. The WEIP-S has gained extensive use due to its brevity, theoretical and practical grounds (Jordan & Lawrence, 2009). This version of the WEIP has been used in several studies (Barczak, Lassk, & Mulki, 2010; Jordan & Troth, 2004; Troth et al., 2012).

Extensive convergent validity was performed to determine if the WEIP-3 was correlated with existing measures of EI. Five key scales were used for the evaluation: (1) the Self-Monitoring Scales (Lennox & Wolfe, 1984), (2) the Trait Meta-Mood Scale (TMMS) Salovey et

al., 1995), (3) the Interpersonal Reactivity Index (IRI) (Davis, 1994), (4) the Job Associate–Bisociate Review Index (JABRI) (Jabri, 1991), and (5) Emotional Control Scale (Riggio, 1986). Findings revealed a significant correlation between the WEIP-3 and aspects of these five key scales. All correlations were significant at P <.01, except for two correlations. The Cronbach alpha, a measure of reliability of multiple items range from .58 to 86. The authors indicate their scales admirably performed in the tests of convergent and discriminant validity to suggest acceptable use as a unidimensional index of EI in workgroups.

The WEIP-S 16-item confirmatory factor analysis model demonstrated an overall good fit. Replicative confirmatory factor analyses were performed in two additional samples resulting sufficient construct validity and reliability of the four dimension scale. The second sample demonstrated moderate bivariate correlations to indicate that may be empirical overlap (and therefore conceptual overlap) between the constructs. Internal consistency reliability statistics for the four constructs were moderate to high across all three studies. Cronbach alpha ranged from .76 to .86. Test-retest reliability demonstrated consistency for the WEIP-S across three points in time. The mean difference for a particular construct ranged from .02 to .19; the standard deviation difference for a particular construct ranged from .01 to .09. None of the means for a construct were significantly different from one another. Cronbach alpha for the four constructs ranged from .73 to .88, with an average reliability of .82. Across time periods, the matched construct variable correlations ranged from .47 to .66 with a mean of .59. Test–retest reliabilities between the three time periods were moderate to high and reflective of good levels of stability across time for the WEIP-S constructs. These findings provide evidence of the reliability and extension for the construct validity of the WEIP-S. The WEIP-S short form represents comprehensive, theoretically sound measures for TEI in the workplace.

Neurophysiological Team Emotion Measures

Current advances in cognitive neuroscience are uncovering the neural bases of cognitive, emotional, and social processes (Dimoka, Pavlou, & Davis, 2011). These processes offer new insights into the complex interplay between IT and information processing, behavior among people, and organizations (e.g. teams). NeuroIS is a relatively new domain of literature where the focus is to advance cognitive neuroscience in IS research. The NeuroIS approach examines a deeper understanding of behavior that can capture hidden (automatic or unconscious) mental processes such as deep emotions that are difficult or even impossible to measure with existing measurement methods and tools.

Recently, a team of neuroscientists created a detailed map of the brain regions that contribute to emotional intelligence (Anderson, 2013). The scientists found significant overlap between general intelligence and emotional intelligence in terms of both the behavior and in the brain. The results showed higher scores on general intelligence tests corresponded significantly with higher performance on measures of emotional intelligence, and many of the same brain regions were found to be important to both. Krueger et al. (2009) examined the neural bases of key competencies of emotional intelligence in a sample of combat veterans. The researchers administered standard neuropsychological tests to assess patients' cognitive functioning and emotional intelligence. Two key competencies of the EI from the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) were examined: 1) Strategic EI, a competency to understand and manage emotions and 2) Experiential EI, a competency to perceive and use emotions. The results revealed that key competencies underlying EI depend on distinct neural prefrontal cortex substrates.

Several IS scholars have begun to investigate collective emotion behaviors in teams using physiological measures and have shown great promise (Caya, Léger, Grebot, & Brunelle, 2012; Léger, Riedl, & vom Brocke, forthcoming; Ortiz de Guinea, Titah, & Léger, 2013). Caya et al., (2012) assert that measuring team emotional variability under psychometric scale raises multiple challenges. The self-reported scales are susceptible to subjectivity bias, social desirability bias, and demand effects. The use of neurophysiological tools offers a way to measure the real time and objective reactions (Dimoka et al., 2011) from subjects in teams. The neurophysiological tools provide the ability to cross-validate and measure complex IS constructs that are hard to capture accurately with a single data source. In strongly coordinated IT teams, it is possible to look at the team entity and evaluate through the use of neurophysiological measures implicit patterns of behavior (Loos, Riedl, Müller-Putz, vom Brocke, Davis, Banker, & et al., 2010; Léger et al., 2010; Caya et al., 2012; Léger, Riedl, & vom Brocke, forthcoming).

As part of an ongoing research project, Léger et al. (2010) preliminary research investigated the effectiveness of psychophysiological measures of cognitive absorption. These researchers found correlation between electrodermal activity (EDA) and several dimensions of the cognitive absorption construct. In a multi-study research program, Léger, Sénécal, Aubé, Cameron, Ortiz de Guinea, Brunelle, et al., (2013) propose to develop a reliable predictive model capable of identifying individual flow states and through the concurrent, synchronized, or non-linear relationships between the individual flow of group members to arrive at a model for identifying group flow (e.g team flow). Their research program aims to uncover a better understanding of group flow convergence and its influence on group performance (i.e. team performance).

Group emotion (i.e. team emotion) was measured during knowledge-work tasks using facial electronmyographic (EMG) activity and EDA (Salminen, Ravaja, Kallinen, & Saari, 2013). Their findings suggest that mediated textual cues of group emotion can lead to emotional contagion to the individual group members during distributed knowledge work. The emotional contagion is an important antecedent affecting the teams' emotional intelligence (Kelly & Barsade, 2001). Emotional contagion occurs within a team when implicit emotion processes transfers to nearby individuals within the team (Kelly & Barsade, 2001). These processes are relatively automatic and convey the unconscious tendency to "mimic and synchronize facial expressions, vocalizations, postures, and movements with those of another person and, consequently, to converge emotionally" (Hatfield, Cacioppo, & Rapson, 1992, p. 151).

Team emotional responses were investigated to understand how expert and novice users differ in a decision-making context while using an Enterprise Resource Planning (ERP) system in a simulated SAP business environment (Léger, Riedl, & van Brocke, forthcoming). Their study measured emotional responses using EDA instead of using self-report measures. EDA measure of AMP.NS.EDR, which is most often associated with stress, had a strong significant negative direct effect on information sourcing from an ERP system. Additionally, the EDA SD.NS.EDR, a measure for the variation relevant to the activity task, served as a proxy for the somatic response elicited during the decision making process. Interaction effect observed with expertise was strong where results showed higher variation for expert subjects from the amplitude of the electrodermal responses. These results show pivotal advances in physiological measures to capture and show significant variability in behaviors implicating information system usage in teams.

Research in team emotional behaviors utilizing neurophysiological measures is gaining momentum. Neurophysiological tools offer reliable data which may be difficult or impossible to obtain with traditional tools, such as self-reported or archival data (Dimoka et al., 2012). These type of measures are less biased and tap into the subconscious awareness of humans. Neurophysiological data can be advantageous for several reasons: 1) continuous real-time measurement while subject is executing a task or responding to specific stimulus, 2) provides the ability to capture the flow of one or more constructs at a time, and 3) can potentially help to infer causal relationships among IS constructs.

Conclusions

This research has reviewed five psychometric instruments that have been used to assess TEI. Evident from the literature, TEI is an important aspect for EI research. The Mayer & Salovey (1990; 1997) model of EI has shown to be the most common basis for the appropriate model. Their model of EI reflects behavior in the real world, purposeful and directed toward team goals. Most salient are its characteristics that emphasize (a) perception, (b), assimilation, (c) understanding, and (d) management of emotions as a four dimensional construct. This conceptualization has substantial application for the TEI measures. Table 1 in the Appendix summarizes the TEI measures and literature.

TEI is considered more complex than individual EI where an array of emotional and collaborative interactions captures unique input behavior of a team. Tannenbaum, Beard, & Salas (1992) team effectiveness theoretical model has argued that EI is a team input characteristic. Recent literature has shown the value in conceptualizing how individual characteristics combine at the team level impacting team performance outcomes (e.g. Bell, 2007; Peeters, Van Tuijl, Rutte, & Reymen, 2006; Joshi, Liao, & Jackson, 2006; Troth et al., 2012). Thus, behaviors at the team-based unit in organizations are important to improving team

processes and performance. Therefore, EI can play a variety of important roles to help facilitate interactions of the employees within a company.

All of the TEI psychometric instruments reviewed are a self-report measure where limitations exist just as with other self-reported EI measures. Generally in the social sciences, research participants want to respond in a way that makes them look as good as possible (Moorman & Podsakoff, 1992; Podsakoff, Mackenzie, Lee, & Podsakoff, 2003). Thus, they tend to under-report behaviors deemed inappropriate by researchers, and over-report behaviors viewed as appropriate. Consequently, self-report bias is likely in organizational behavior research because employees often believe there is at least a remote possibility that their employer could gain access to their responses.

Also there exists a tendency for individuals to respond in socially desirable ways (Moorman & Podsakoff, 1992; Zerbe & Paulhus, 1987). Utilizing respondents across a broad spectrum of industries can help mitigate the potential bias. Many authors of the TEI scales suggest extensive testing be performed on the measures for predictive validity in applied settings. In particular, research could focus on predicting task and contextual performance in teams at multiple levels of analysis.

In general, the TEI measures have demonstrated adequate internal consistency reliability. Self-report TEI measures have acceptable internal consistency as do the overall scales for ability-based measures. The ability-based EI measures have acceptable construct, discriminant, and convergent validity and test–retest reliability. However, due to the emergent state of team/group EI, few studies exist to provide additional reliabilities and stability of the measures. This will be maximized as more research utilizes the team/group level measures in future research.

Neurophysiological tools can offer a novel and unique measures with implications for greater accuracy of team behaviors. Such neurophysiological tools as eye tracking, skin conductance response (SCR), facial electromyography (fEMG) and Electrocardiogram (EKG) can be used to measure team-level behavior (e.g. Dimoka, et. al., 2011). Brain imaging tools such as Functional Magnetic Resonance Imaging (fMRI), Positron Emission Tomography (PET), Electroencephalography (EEG), and Magnetoencephalography (MEG) are some of the most commonly used neurophysiological tools. These tools are not without weaknesses, though they offer greater accuracy, continuous real-time measurement, are less subjective, and not restricted to conscious awareness. Neurophysiological tools can be costly, have limited accessibility, , have labor-intensive data extraction and analysis, and difficult in interpreting results (*ibid*). These challenges and others must be acknowledged to fully capitalize the potential of neurophysiological measures (Mayer, Roberts, & Barsade, 2008).

Cooperative team norms can play a substantial role in how team members will interact with one another, their decision-making, and problem-solving. These norms can be particularly helpful for teams in the broader organizational and cross-boundary contexts. When team cooperative norms develop, the potential exists to create an awareness and management of one's emotion to guide the teams' thinking and behavior. No team can easily exist without a set of cooperative norms. Without cooperative norms, the team may perhaps be chaotic and disordered because there would be no boundaries for proper behavior in the team environment (Chatman & Flynn, 2001).

Overall, this research addresses a gap in the literature to inform IT researchers about TEI measures that can used to help explain performance and collaboration in IT teams. The TEI assessments are an initial attempt to comprehensively identify those measures that can

adequately address TEI behaviors in the context of IT teams. All psychometric measures appear to sufficiently measure TEI. The WEIP-S has shown significant empirical evidence to evaluate TEI where the item scales address emotional intelligence specifically from a team perspective. This is an important theoretical contribution to help explain emotional intelligence abilities at the team level, despite WEIP-S some empirical overlap and subsequent conceptual overlap as evidenced between the constructs. The WEIP-S assessment is short and consists of 16 items, 4 items for each of the four emotional abilities. Its use has practical application, provides a short, easy to use self-report, and measures workplace-based emotion intelligence. The WLEIS has limitations that warrant consideration and use with a Chinese population only. This research provides insights that can advance TEI measures in the IT teamwork setting that can be invaluable to understand team-level outcomes and behaviors.

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Appendix

Table 1 Summary of TEI measures and literature

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
Wong & Law (WLEIS)	WEIS consists of two parts. The first part contains 20 scenarios and respondents are required to choose one option that best reflects their likely reaction in each scenario. The second part contains 20 ability pairs and respondents are required to choose one out of the two types of abilities that best represent their strengths.	Salovey & Mayer (1990), Schutte et al. 1998	-Foo, M.D., Elfenbein, H.A., Tan, H.H., & Aik, V.C. (2004). Emotional intelligence and negotiation: The tension between creating and claiming value. International Journal of Conflict Management, 15(4), 411-429. -Law, K. S., Wong, C. S., & Song, L. J. (2004). The construct and criterion validity of emotional intelligence and its potential utility for management studies. Journal of Applied Psychology, 89(3), 483-496. -Wong, C.S, Wong, P.M., & Law, K. S. (2007). Evidence on the practical utility of Wong's emotional intelligence scale in Hong Kong and Mainland China. Asia Pacific	Wong's Emotional Intelligence Scale (WEIS) is a self-report EI measure developed for Chinese respondent (Wong et al., 2007). WEIS is a scale based on the four ability dimensions described in the domain of EI: (1) appraisal and expression of emotion in the self (2) appraisal and recognition of emotion in others (3) regulation of emotion in the self (4) use of emotion to facilitate performance

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
			Journal of Management, 24, 43-60. -Wong, C.S, Foo, M., Want, C., & Wong, P. (2007). The feasibility of training and development of EI: An exploratory study in Singapore, Hong Kong and Taiwan. Intelligence, 35(2), 141-150. -Wong, C.S., Law, K.S., & Wong, P.M. (2004). Development and validation of a forced choice emotional intelligence for Chinese respondents in Hong Kong. Asia Pacific Journal of Management, 21(4), 535-559. -Hur, Y., van den Berg, P. T., & Wilderom, C. P. (2011). Transformational leadership as a mediator between emotional intelligence and team outcomes. The Leadership	

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
			Quarterly, 22(4), 591-603.	
Schutte Emotional Intelligence Scale (EIS, SSEIT, SREI)	The Schutte Self Report Emotional Intelligence Test (SSEIT) is a 33 item self-report measure of emotional intelligence developed by Schutte et al. (1998). The SREIS has been designed to map onto the Salovey and Mayer (1990) model of EI.	Salovey & Mayer (1990)	Austin, E., Saklofske, D., Huang, S., & McKenney, D. (2004). Measurement of trait EI: Testing and cross-validating a modified version of Schutte et al.'s (1998) measure. Personality and Individual Differences, 36, 555–562. Bailie, K. & Ekermans, G. (2006). An exploration of the utility of a self-report emotional intelligence measure. E-Journal of Applied Psychology, 2, 3-11. Grant, A.M. (2007). Enhancing coaching skills and emotional intelligence through training. Industrial and	Items of the test relate to the three aspects of EI: (1) appraisal and expression of emotion (2) regulation of emotion (3) utilisation of emotion

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
			Commercial Training, 39(5), 257-266. Rozell, E.J., Pettijohn, C.E., & Parker, S.R. (2006). Emotional intelligence and dispositional affectivity as predictors of performance in salespeople. Journal of Marketing Theory and Practice, 14(2), 113-124. Saklofske, D.H., Austin, E.J., & Minski, P.S. (2003). Factor structure and validity of a trait emotional intelligence measure. Personality and Individual Differences, 34, 702–721. Schutte, N.S., Malouff, J.M., Hall, L.E., Haggerty, D.J., Cooper, J.T., Golden, C.J., et al. (1998). Development and validation of a measure of emotional intelligence. Personality and	

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
			Individual Differences, 25, 167-177. Schutte, N.S., Malouff, J. M., Simunek, M., Hollander, S., & McKenley, J. (2002). Characteristic emotional intelligence and emotional well-being. Cognition and Emotion, 16, 769–786. Schutte, N.S., Schuettpelz, E, & Malouff, J.M. (2001). Emotional intelligence and task performance. Imagination, Cognition, and Personality, 20, 347-354. Chang, J. W., Sy, T., & Choi, J. N. (2012). Team Emotional Intelligence and Performance. Small Group Research, 43(1), 75-104.	

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT v2)	The Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) is an ability-based test designed to measure the four branches of the EI model of Mayer and Salovey. MSCEIT was developed from an intelligence-testing tradition formed by the emerging scientific understanding of emotions and their function and from the first published ability measure specifically intended to assess emotional intelligence, namely Multifactor Emotional Intelligence Scale (MEIS).	Salovey & Mayer (1990, 1997)	Brackett, M. A., & Mayer, J. D. (2003). Convergent, discriminant, and incremental validity of competing measures of emotional intelligence. Personality and Social Psychology Bulletin, 29, 1147-1158. Cote, S. & Miners, C.T.H. (2006). Emotional intelligence, cognitive intelligence, and job performance. Administrative Science Quarterly, 51(1), 1-28. Ivcevic, Z., Brackett, M. A. & Mayer, J. D. (2007). Emotional intelligence and emotional creativity. Journal of Personality, 75, 199-235. Mayer, J. D., Salovey, P., & Caruso, D. R. (2004). Emotional intelligence: Theory, findings, and implications. Psychological	The Four Branches of Emotional Intelligence Perceiving Emotions: The ability to perceive emotions in oneself and others as well as in objects, art, stories, music, and other stimuli Facilitating Thought: The ability to generate, use, and feel emotion as necessary to communicate feelings or employ them in other cognitive processes Understanding Emotions: The ability to understand emotional information, to understand how emotions combine and progress through relationship transitions, and to appreciate such emotional meanings Managing Emotions: The ability to be open to feelings, and to modulate them in oneself and others so as to promote personal understanding and growth *From "Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT), by J. D. Mayer, P. Salovey, and D. R. Caruso, 2002, Toronto, Ontario: Multi-Health Systems, Inc.

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
	MSCEIT consists of 141 items and takes 30-45 minutes to complete. MSCEIT provides 15 main scores: Total EI score, two Area scores, four Branch scores, and eight Task scores. In addition to these 15 scores, there are three Supplemental scores (Mayer, Salovey, & Caruso, 2002).		Inquiry, 15, 197-215. Mayer, J. D., Salovey, P., Caruso, D. R., & Sitarenios, G. (2003). Measuring emotional intelligence with the MSCEIT V2.0. Emotion, 3, 97-105. Palmer, B., Gignac, G., Manocha, R., & Stough, C. (2005). A psychometric evaluation of the Mayer-Salovey-Caruso emotional intelligence test version 2.0. Intelligence, 33, 285–305. Crombie, D. & Lombard, C. & Noakes, T. (2009). Emotional intelligence scores predict Team Sports Peformance in a National Cricket Competion, 4(2), 1747-9541. Chang, J. W., Sy, T., & Choi, J. N. (2012). Team Emotional Intelligence and Performance. Small Group	

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
			Research, 43(1), 75-104. Farh, C. I., Seo, M. G., & Tesluk, P. E. (2012). Emotional intelligence, teamwork effectiveness, and job performance: The moderating role of job context. Journal of Applied Psychology, 97(4), 890.	
Group Emotional Competence (GEC) Inventory	The Group Emotional Competence (GEC) inventory is based on the work of Vanessa Druskat and Steven Wolff who have pioneered the application of emotional competence concepts at the group level. Their research has shown that GEC norms improve group effectiveness by building social capital, which	Emotionally Competent Group Norms (ECGN)	-Hamme, C. (2003). Group emotional intelligence: The research and development of an assessment instrument. Dissertation, Rutgers, New Brunswick, NJ. -Koman, E., Wolff, S. B., & Howard, A. (2008). The Cascading Impact of Culture: Group Emotional Competence (GEC) as a Cultural Resource. In R. Emmerling, V. Shanwal, & M. -Mandal (eds.), Emotional Intelligence:	

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
	facilitates engagement in effective task behaviors and processes. Christina Hamme Peterson's (2001) study of an early version of the instrument provides support for its reliability and validity. The instrument has now been administered to over 150 teams and provides feedback on 9 group norms that research has shown are linked to team effectiveness. Feedback is useful for helping groups better understand their strengths and weakness and to identify areas for improvement. The instrument contains 57		Theoretical and Cultural Perspectives. San Francisco: Nova Science Publishers. -Koman, E. S., & Wolff, S. B. (2008). Emotional intelligence competencies in the team and team leader: A multi-level examination of the impact of emotional intelligence on team performance. Journal of Management Development, 27(1), 55-75. -Stubbs, C. E. (2005). Emotional intelligence competencies in the team and team leader: A multi-level examination of the impact of emotional intelligence on group performance. Dissertation, Case Western Reserve University, Cleveland, OH. -Wolff, S. B., Druskat, V. U., Koman, E. S. & Messer, T. E., (2006). The link	

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
	items that measure the nine dimensions of GEI.		between group emotional comeptence and group effectiveness. In V. U. Druskat, F. Sala, & G. Mount (Eds.), Linking emotional intelligence and performance at work: Current research evidence with individuals and groups. Mahway, NJ: LEA.	
WEIP/WEIP-S (short form)	The Work Group Emotional Intelligence Profile (WEIP) is a self-report measure designed to measure emotional intelligence of individuals in teams. The measure employs a seven-point reference format ranging from 1 (strong disagree) to 7 (strongly agree), with items encouraging	Salovey & Mayer (1990)	-Ayoko, O. B., Callan, V. J., & Hartel, C. E. J. (2008). The influence of team emotional climate on conflict and team members' reactions to conflict. Small Group Research, 39(2), 121-149. -Jordan, P. J., Ashkanasy, N. M., Hartel C. E. J., & Hooper, G. S. (2002). Workgroup emotional intelligence scale development and relationship to team process effectiveness and goal focus. Human Resource	The WEIP6 captures two dimensions of emotional intelligence: Ability to Deal with Own Emotions (Scale 1: 18 items) and Ability to Deal with Others' Emotions (Scale 2: 12 items) discerned by Jordan et al. (2002). Scales 1 and 2 are delineated into 5 subscales. Scale 1 is composed of the subscales Ability to Recognize Own Emotions, Ability to Discuss Own Emotions, and Ability to Manage Own Emotions. Scale 2 is composed of the subscales Ability to Recognize Others' Emotions and Ability to Manage Others' Emotions. Team

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
	reflection on one's own behavior, such as "I am aware of my own feelings when working in a team" and "I am able to describe accurately the way others in the team are feeling."		Management Review, 12, 195-214. -Jordan, P. J. & Troth, A. C. (2004). Managing emotions during team problem solving: Emotional intelligence and conflict resolution. Human Performance, 17(2), 195-218. -Moriarty, P., & Buckley, F. (2003). Increasing team emotional intelligence through process. Journal of European Industrial Training, 27(2/3/4), 98- -Jordan, P. J., & Troth, A. (2011). Emotional intelligence and leader member exchange: The relationship with employee turnover intentions and job satisfaction. Leadership & Organization Development Journal, 32(3), 260-280.	emotional intelligence is measured by calculating the average scores of the WEIP6 for all team members. The WEIP model has undergone several successive modifications since its initial creation by Jordon et al. 2002.

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
			-Troth, A. C., Jordan, P. J., & Lawrence, S. A. (2012). Emotional Intelligence, Communication Competence, and Student Perceptions of Team Social Cohesion. Journal of Psychoeducational Assessment, 30(4), 414-424. -Troth, A. C., Jordan, P. J., Lawrence, S. A., & Tse, H. H. (2012). A multilevel model of emotional skills, communication performance, and task performance in teams. Journal of Organizational Behavior. -Troth, A. C., Jordan, P. J., & Lawrence, S. A. (2012). Emotional Intelligence, Communication Competence, and Student Perceptions of Team Social Cohesion. Journal of Psychoeducational	

EI Measure	Description	Theoretical Model Based On	Paper Citation	What is measured?
			Assessment, 30(4), 414-424. -Ghosh, R., Shuck, B., & Petrosko, J. (2012). Emotional intelligence and organizational learning in work teams. Journal of Management Development, 31(6), 603-619. -Barczak, G., Lassk, F., & Mulki, J. (2010). Antecedents of team creativity: An examination of team emotional intelligence, team trust and collaborative culture. Creativity and Innovation Management, 19(4), 332-345.	

III. IT Teams: Disentangling Cooperative Norms, Team Emotional Intelligence, and Behaviors: A Moderated Mediation Analysis

Introduction

In today's global information economy, successful team performance depends on effective team collaboration, gathering and exchange of information, and coordinated expertise (Faraj & Sproull, 2000; Choi et al., 2010; Hollingshead, Gupta, Yoon, & Brandon, 2012). As organizational downsizing continues amid the delayering of the hierarchy, team structures are constantly changing and adapting. The normative expectations, dynamic interactions of the team members and emotional states evolve and emerge at the team level. The interactions within a team create phenomena and structures that serve to shape and constrain the phenomena (Kozlowski & Bell, 2003). For example, organizations rely on teams to perform tasks that are technically complex, very demanding, and require coordinated effort (Driskell, Salas, & Hughes, 2010). In IS research, context encompasses the characteristics and usage environments of the technology artifact (Hong, Chan, Thong, Chasalow, & Dhillon, 2013). The authors put forth that the characteristics of the technology artifacts are at the core of context-specific theorizing in IS research. Thus, to fully address IT team phenomena, enterprise technology use, a contextually-specific settings, bring a richness in which to study and explore team behavior in real-world environments.

Information systems research is increasingly acknowledging the important role that contextual factors beyond the individual can impact affect technology-related behavior. For instance, Gallivan, Spitler, & Koufaris (2003) highlight the need for research to incorporate "influences at levels beyond the individual user that shape how employees use IT in their jobs" (p.155). These authors assert that such influence could exist at the level of the workgroup (i.e.

team). Increasingly, IT scholars have placed emphasis on understanding the role of emotion as a determinant of technology use behavior, interpersonal exchange, and performance for organizations (Venkatesh, 2000; Beaudry & Pinsonneault, 2010; Dimoka, Pavlou, & Davis, 2011; Ortiz de Guinea & Webster, 2013; Stieglitz & Dang-Xuan, 2013; Tsai & Bagozzi, 2014).

Furthermore, Akgün, Keskin, Byrne, & Gunsel (2011) put forth that success of IT software teams depends not only on the interaction of knowledge and skills among team members which requires intense social interactions, but also the team emotional capability. Their empirical results show that team emotional capability mediates the relationship between collaboration among team members and market success of the software products. Their findings suggest emotion management and regulation act as a platform to actualize joint behavior toward the team outcomes. Moreover, Beaudry & Pinsonneault (2010) argue that emotions are important drivers of behavior and that certain emotions experienced early in the implementation of a new IT application relates to actual IT use and task adaption. Because, technology introductions, task adaptions, and continued IT use have uncertain disruptive events associated with them, it is critical that teams have emotion mechanisms in place to enable their members to develop and manage the emotions of its members. Specifically, team emotional intelligence (TEI) offers benefit accrued through social interactions among emotionally intelligent individuals (Kelly & Barsade, 2001), and team performance often relies on interpersonal skills and harmony among members (Driskell & Salas, 1992), therefore, TEI may be a key element in high-performing teams. Thus, understanding the conditions under which TEI shapes team dynamics and team performance is important.

Both social relationships and emotion can play a key role in how Information Technology (IT) is harnessed and knowledge is exchanged for performance gains (Peslak, 2005; Akgün, et

al., 2011; Ayse & Acikgöz, 2013). Individuals emerge as teams and take on collective characteristics in an atmosphere where norms build emotional capacity (the ability to respond constructively in emotionally uncomfortable situations) and influence emotions in constructive ways to carry out their work (Elfenbein, 2006; Druskat & Wolff, 2008). In this manner, the team emotion combines cognitive and social interactions where team members interact at a collective level to develop their TEI. The team focus is mindful of the emotions of its members, its own team emotions, and the emotions of other teams, and individuals outside its boundaries (Druskat & Wolff, 2001). Decades of research provides ample evidence that emotion is a central and inevitable part of life in work teams (Bales, 1953; Tuckman, 1965; Kelly & Barsade, 2001; Druskat & Wolff, 2008).

Having emotionally intelligent individuals within the team will not result in an emotionally intelligent team, however team cooperative norms can play an important role in building the team members' abilities to respond constructively in emotionally uncomfortable situations (Turner & Lloyd-Walker, 2008). The cooperative team norms help facilitate how team members perceive and interact with one another, approach decisions, and solve problems (Chatman & Flynn, 2001); yet, IT team interactions are not purely rational behavior (Casciaro & Lobo, 2005) where intra-team conflict is imminent.

Simply placing individuals in a team will not necessarily make the team successful. Real-world examples have shown that a lack of teamwork or failure to function collectively as a team has led to disastrous consequences. Edmondson (2012) advocates that "teaming calls for developing both affective (feeling) and cognitive (thinking) skills" (p. 33). IT teams can be considered as teams that purposefully make an effort to change their state of knowledge (i.e. Choi, Kang, & Lee, 2008). The IT systems help team members to utilize their knowledge, gain

problem-solving efficiency, and coordinate expertise efforts (Faraj & Sproull, 2000; Bharadwaj, 2000; Burton-Jones & Gallivan, 2007; Caya, Léger, Grebot, & Brunelle, 2012). IT teams' knowledge-intensive work is highly complex and interdependent where collaborative decision-making is essential. The more team members exhibit strong mutual interdependence, the more likely they are to invoke emotions in one another and the more inextricably linked are their emotions (Clark, Fitness, & Brissette., 2004), producing shared emotions (Kelly & Barsade, 2001).

Teams frequently develop cooperative norms to guide their interactions and to deal with emotionally challenged situations. TEI skills offer benefit that may reduce intra-team conflict which can lead to performance gains. These factors imply team cooperative norms, TEI, and performance cannot be subsumed within simple mediation models, but might depend on moderating variables. Such moderators as intra-team conflict and expertise coordination might differ within team behaviors. By simultaneously considering the roles of these teams' behaviors and their emotion regulation abilities, an integrated model may guide the understanding how and when team performance changes as a result of indirect, positive TEI.

The aim of this paper is to understand how and when TEI mediates the effect of cooperative norms on performance as a function of the underlying levels of intra-team conflict and team expertise coordination. Specifically, the study explores the extent to which team members, as whole, behaviorally express emotional management ability under varying conditions. The components in this study (simple mediation and moderation) have been tested before, but now are combined in a model of moderated mediation. The context for this study is corporate IT teams that use enterprise technology systems to perform their task work. A benefit to IT researchers, Weber (2003) suggests for richer theory development, researchers should take

into greater consideration to generate insights about the phenomena associated with IT in the organizational structure. Thus, value can be gained in understanding how context-specific IS situations and constraints affect have meaning in team behavior (i.e. John, 2006).

This research study represents the first study to test moderated mediation for these constructs in the context of IT teams. It is argued that levels of intra-team conflict and expertise coordination will function as boundary conditions on the mediating effect of TEI on team cooperative norms and performance.

Theoretical Framework and Hypothesis Development

Moderated-Mediated Effects

Boundary conditions that describe and invoke the conditional and contingent nature of mechanisms enriches the phenomenon studied (Muller, Judd, & Zyzerbyt, 2005; Edwards & Lambert, 2007; Preacher, Rucker, & Hayes, 2007). Moderated-mediation is a type of conditional analysis that can help understand and describe the conditional nature of the mechanisms by which a variable transmits its effect on another while testing contingent effects (Preacher, Rucker, & Hayes, 2007; Edwards & Lambert, 2007; Hayes, 2013). This type of conditional analysis emphasizes systematic variation in conditional indirect effects on one or more moderator variables. This means an overall moderation is produced by the mediating process, and when this process is controlled, the residual moderation of the effect is reduced (Muller, Judd, & Zyzerbyt, 2005).

When team interactions are perceived as informally regulated, highly reliable, dependably cohesive teams are more able to cope with various emotionally taxing organization events (Huy, 1999). Such team behaviors manifest through normative behaviors toward team self-evaluation, proactive problem-solving, examination of emotion expression, and positive self-efficacy (Koman & Wolff, 2008). Moreover, teams' intra- conflict (Klimoski & Jones, 1995;

Sarker & Valacich, 2010) and expertise coordination (Faraj & Sproull, 2000) have been found to minimize or maximize team interactions. Thus, the connections between team norms, emotional intelligence, salient team behaviors, and performance are deserving of more attention and the understanding of these unique associations in teams.

It is argued that a team's response-focused emotion regulation (i.e. their strategies for dealing with emotional responses) can influence their performance by acting as a boundary condition on the predicted relationship between team cooperative norms and performance. Various team behaviors may influence the effectiveness of this relationship such that performance is altered. For example, harmonious and cohesive teams' interactions can utilize emotional strategies at times of excessive intra-team conflict to adjust their behaviors to influence their performance. Understanding the how and when enables insights into the boundary conditions where targeted strategies for performance improvements can be identified. This study focuses on the extent to which team members, as a whole, behaviorally express emotional management ability under varying conditions.

Figure 1 shows the research model probing the conditional analysis to examine cooperative team norms, TEI, team performance with the moderators, intra-team conflict, and team expertise coordination.

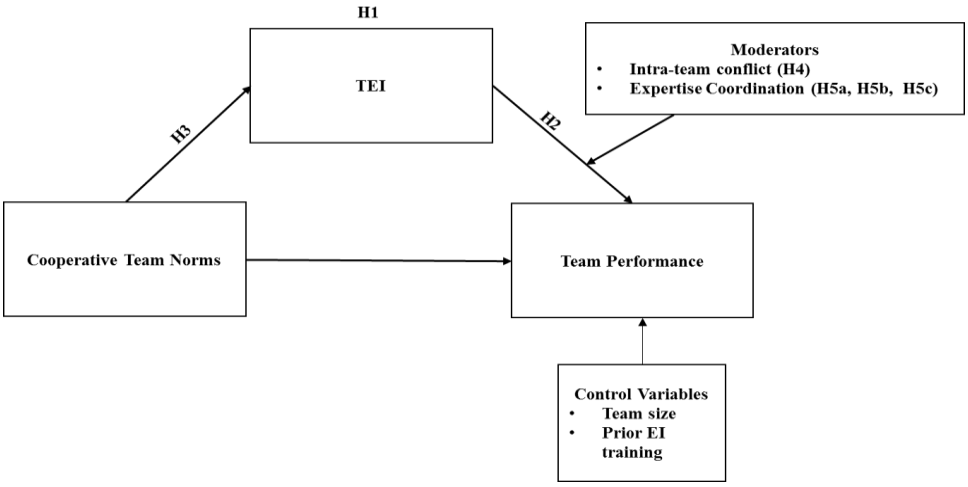

Figure 1 A Research Model of Cooperative Team Norms, TEI, Team Performance along with moderators Intra-team conflict and Expertise Coordination.

Team Emotional Intelligence

Zerbe & Härtel (2000) suggest when emotions are considered, the nature of the relationship between the constructs is revealed. They advocate when failing to consider the possible role of emotions perhaps limit the understanding of the "black box" concerning the phenomenon of interest related to antecedents, consequences, and outcomes. As a result, how emotions increase or decrease relationships and their boundary condition, relations may be overlooked or overemphasized.

TEI is a multi-dimensional, emotion regulation construct characterized by four distinctive factors. According to Jordan & Lawrence (2009), there are four dimensions of TEI behavior. First, awareness of one's own (AWR) emotions is the ability to discuss and disclose one's emotions. Second, awareness of others' emotions (AWRO) is one's ability to read faces and

body language. Third, management of one's own emotions (MGT) is the ability to delay or withhold strong emotional reactions. And lastly, management of others' emotions (MGTO) is the ability to positively influence others' emotions. Jordan & Lawrence four dimensions of the TEI represent their attempt to address a theoretical and parsimonious mode of emotional intelligence in work teams.

The relationships between the TEI multi-dimensional construct and its sub-dimensions are not causal forces linking separate conceptual entities, but instead represent associations between a general TEI concept and the sub-dimensions that constitute the team-level construct. The TEI scale measures produce psychometrically sound, short measures that are indicative of the behaviors and performance in teams. The TEI sub-dimensions are viewed as defining characteristics of the TEI construct and its sub-dimensions where a change in one of the sub-dimensions is associated with a change in the TEI construct (MacKenzie, Podsakoff, & Podsakoff, 2011). For this reason, in this paper, the TEI sub-dimensions will be best modeled as formative indicators of a second-order construct.

Prior research has found EI as a mediator when evaluating behavior (Donaldson-Feilder & Bond, 2004; Schutte & Malouff, 2011). Donaldson-Feilder & Bond (2004) theoretical underpinnings suggest that EI significantly mediates between mindfulness and higher positive affect, lower negative affect, and greater life satisfaction for individuals. Sue-Chan & Latham (2004) find EI completely mediated the relationship between situational interviews and team behaviors. It is hypothesized TEI will mediate the relationship between cooperative team norms and team performance.

H1: TEI will mediate the relationship between cooperative team norms and team performance

Team Emotional Intelligence and Team Performance

Team performance is conceptualized as the capability of the team and the processes they undertake to reach their goals (Kozlowski & Illgen, 2006) in an effective and efficient manner. Teams' effectiveness and efficiency are not necessarily the same always under the various conditions in which they operate. Effectiveness pertains specifically to the accomplishment of the goals, milestones, and objectives as defined by the requirements in the project context or the project stakeholders. Efficiency is characterized as the degree to which the cost of achieving the team's desired outcomes meets the planned project cost and time schedule. Moreover, prior literature has demonstrated these two dimensions of performance as essential for knowledge-intensive teams (Ancona & Caldwell, 1992; Leonard-Barton & Sinha, 1993) such as ERP teams. Ancona & Caldwell (1992) recommend that project stakeholders perceive a close relationship between effectiveness and efficiency measures of performance. Though their empirical findings indicate high correlations of effectiveness and efficiency measures, the measures were kept separate because project stakeholders viewed them as separate dimensions.

A growing number of researchers suggest emotional intelligence contributes to performance gains (Kelly & Barsade, 2001; Jordan & Troth, 2004; Wolff, Druskat, Koman, & Messer, 2006; Koman & Wolff, 2008; Farh, Seo, & Tesluk, 2012). Research has shown that team members who have high-quality relationships, which are more likely in teams with high EI, will reciprocate with higher performance (Graen & Uhl-Bien, 1995). Teams with high-EI members may utilize their emotions in ways to achieve better cognitive and decision-making processes (Mayer, Salovey, & Caruso, 2000). Team members who are high in collective orientation are likely to attend to the task inputs and needs of fellow team members during

performance (Salas, Cooke, & Rosen, 2008). Thus, it is hypothesized TEI will be positively associated with team performance.

H2: TEI will positively influence team performance

Cooperative Team Norms

Team norms are guidelines for acceptable and unacceptable behavior that develop through interactions among group members (Cialdini & Trost, 1998). Some norms are formally transmitted (e.g. explicit statements, rituals) whereas others are informally transmitted (e.g. nonverbal behaviors, imitation). The teams' cooperative norms emerge as patterns of behavior that can influence and build emotional capacity, develop social capital, and lead to effectiveness (e.g. Druskat & Wolff, 1999).

Norms have a strong influence on team-based behavior and are difficult to change (Parks, 2011). When individuals join teams, their feelings of uncertainty regarding expected actions become clearer through team communications and nonverbal interactions. Consistent with social exchange theory, norms give rise to social behavior through an exchange process where the social relationships maximize or minimize to benefit the team as a whole. As a result of team norms, "team members tend to decrease the variance in their behavior" (Vroom, 1969, p. 223). Moreover, norms can influence team outcomes such as quality, productivity, and creativity even if team members have the skills to achieve high levels of success in addressing complex tasks (Chatman & Flynn, 2001)

Teams cannot easily exist without established norms (Parks, 2011). Prior research suggests team norms are tightly coupled with the effects of the emotions and linked to team performance (Wolff et al., 2006; Koman & Wolff, 2008). Though team norms may be associated with the teams' emotional experience, it is argued that the emotional experience is a

physiological phenomenon. Emotions are physiological reactions where action sequences are initiated by some stimuli or event (Barsade & Gibson, 2007). Similar to emotions, team norms are psychological phenomena that help to describe and explain human behavior (Cialdini & Trost, 1998). This research study advances team norms as a collective, psychological, human behavior.

When teams are highly interdependent, the absence of strong norms to support task work and collaboration detracts from team effectiveness, while the negotiation of common expectations and agreed-upon team norms contribute to performance (Taggar & Ellis, 2007; Parks, 2011). For example, a less cooperative team may encounter difficulty integrating individual contributions and ideas into a cohesive final outcome. Moreover, in order to encourage effective team behaviors, prior scholars have suggested that teams establish norms at the beginning of team interaction (e.g. Feldman, 1984; Spich & Keleman, 1985; Argots, 1989; Druskat & Wolff, 2008; Chatman & Flynn, 2001). The norms would provide team members with information about the team's reality and affordance standards against which to compare a person's behavior (Colman & Carron, 2001). Norms create emotional asymmetries that can help team members resolve psychological conflicts (Wilson & O'Gorman, 2003; Lopes, Salovey, Côté, Beers, & Petty, 2005). Consequently, cooperative norms can play a salient precursor role in the development of team emotional behaviors. At the same time, few scholars have considered the consequential nature in which the TEI benefits can be gained. Therefore, it is hypothesized team cooperative norms will influence their team emotional intelligence abilities.

H3: Cooperative team norms influence with TEI

Intra-team Conflict

Broadly, intra-team conflict processes emerge from perceived incompatibilities or differences among group members (De Dreu & Gelfand, 2008). This type of behavior characterizes a component in the team interaction process present in teams without a history and has a limited temporal scope that impacts disagreements during consensus building (Fisher & Ellis, 1990; McGrath, 1984). In particular, relational conflicts such as differences in norms or values (de Wit, Greer, & Jehn, 2012) can harm team performance because they reduce collaborative problem solving (De Dreu, 2006). Prior literature about intra-team conflict among IT teams finds intra-team conflict impacts their performance (e.g. Robey, 1984; Robey, Smith, & Vijayasarthy, 1993; Sawyer, 2001; Barki & Hartwick, 2001; Kankanhalli, Tan, & Wei, 2007). Moreover, contemporary IT scholars suggest that the conflict, if managed well, may improve the team's performance (Robey, Smith, & Vijayasarthy, 1993; Zachary, 1998; Sawyer, 2001; Kankanhalli, Tan, & Wei, 2007).

Jiang, Zhang, & Tjosvold (2013) find teams whose members have considerable emotion regulation abilities are able to use conflict (i.e. task) to help performance and mitigate negative effects of relationship conflict. Jordan & Troth (2004) found emotional intelligence indicators were positively linked with team performance and were differentially linked to conflict resolution methods. Moreover, recent research has begun to identify the conditions under which intra-team conflict may be less likely to result in negative effects on team outcomes when members have low emotionality relationship conflicts (e.g. Jehn, Greer, Levine, & Szulanski, 2008).

IT teams are constantly challenged to address the demands of their complex and fast-paced environment. Software development teams are an example of teams managing team-based

knowledge-intensive work. Gartner's 2014 application development predictions highlight a growing capabilities gap between the services and skills needed by organizations and the internal team's ability to deliver them. Many IT teams possess specialized and unique characteristics that require specific information processing skills compared to other types of business teams (e.g. Storm & Janssen, 2004). Conflict within IT teams' information processing can intensify where the cognitive systems can become overloaded and impede the information processing thus attenuating team performance.

Nonetheless, IT Teams are expected to deliver high performance by providing customer, operational, and employee value through the use of processes and cultural shifts (Hanlan, 2004). Prior research has shown that emotional management behaviors can interact with team-level relationship conflict to influence individual IT behavior patterns across time (e.g. Meng, Fulk, & Yuan, 2013). Traditionally, conflict within teams is associated with reduced productivity, reduced satisfaction in groups, and an overall hindrance to effective group functioning (Wall & Nolan, 1986; Blake & Mouton, 1984; Miranda & Bostrom, 1994; Jehn, 1997; Sawyer, 2001). Moreover, a recent Computerworld article (2011) recommends that IT professionals could avoid the collision between technology and emotion at that moment when emotional intelligence skills can make the difference between a successful outcome and a disaster (Crowley, 2011)

Seemingly, emotions can play a central role in conflict resolution. Desivilya & Yagil (2005) has shown that cooperative conflict management strategies were associated with positive intra-group emotional states. Shih & Susanto (2010) show individuals scoring high on emotional intelligence prefer integrative and compromising conflict management styles. Cooperative team norms play a precursor role benefitting the team environment in the presence of conflict, supporting diverse viewpoints and preventing disagreements from being misinterpreted as

personal attacks (Amason, 1996, De Dreu & West, 2001; Lovelace, Shapiro, & Weingart, 2001; Simons & Peterson, 2000). Thus, it is likely the level of intra-team conflict will change the relationship among the team members and team performance when mediated by the TEI. Specifically, TEI will mediate the relationship between team norms and performance when teams experience high levels of intra-team conflict.

H4: The effect of TEI on performance will be stronger for teams higher on intra-team conflict than for teams lower on intra-team conflict

Expertise Coordination

Since teams are the primary work unit for accomplishing organizational work, effective coordination of team work becomes a significant organizational issue. Expertise coordination relates to team-situated interactions aimed at managing resources and expertise dependencies (Faraj & Sproull, 2000). This type of coordination is different than simple routine tasks; rather, expertise coordination focuses on the complex nonroutine intellectual tasks. The team member expertise is characterized by specialized skills and knowledge brought to the team's task work.

Coordination and expertise in knowledge-intensive teams are important and salient to effective teams, yet the mere presence of expertise is insufficient to produce high quality work (Faraj & Sproull, 2000). In software development teams, when their coordination breakdowns, difficulties in knowledge-intensive teams become the noticeable factors that hinder project outcomes (Summers, Humphrey, & Ferris, 2012). Therefore, how well teams perform is not just a function of having the "right" expertise on the team, but rather the expertise must be coordinated among team members.

Knowing the location of expertise related to the complex and multifaceted team task work is a key aspect for IT knowledge-intensive teams. The teams' ability to integrate

knowledge distribution and exchange is an essential part of IT teams' task work. The location of the potentially useful expertise sources is critical for task work and problem-solving. IT teams require effective and efficient expertise to call on to develop solutions. When teams can recognize who, when, and where appropriate expertise is needed is at the heart of social cognitive interactions. Bringing expertise to bear, relies on a teams' emergent process of informal interactions and joint problem-solving. A lack of sustainable team emotion behaviors could potentially derail the teams' ability to work together smoothly for greater cooperation. In particular, much of the teams' knowledge exchange between team members is tacit (Nonaka & Takeuchi, 1995) and therefore requires an environment supportive of free and content-rich interpersonal interactions.

Consequently, knowing the location of the expertise, recognizing the need for expertise, and bringing the expertise to bear can enable IT teams to manage their skill and knowledge interdependencies effectively. Expertise coordination has a strong relationship with team performance, and this relationship is significant over and above team input characteristics, the presence of expertise, and administrative coordination (Faraj & Sproull, 2000). Therefore, it is expected higher behaviors of expertise coordination will contribute to performance when TEI behaviors are positively utilized. It is hypothesized that higher levels of expertise coordination-expertise location, need for expertise, expertise brought to bear will moderate the effect of TEI on performance when mediated by positive TEI behaviors.

H5a: Expertise location will moderate the effect of TEI on performance such that the effect is stronger for teams higher in expertise location than teams lower in expertise location

H5b: Recognizing expertise will moderate the effect of TEI on performance such that the effect will be attenuated for teams higher in recognition of the need for expertise than teams with lower recognition of the need for expertise

H5c: Expertise need will moderate the effect of TEI on performance such that the effect is stronger for teams higher in expertise needed than teams lower in expertise needed

Method

Sample and Participants

Twenty-four IT teams were studied representing seven Fortune 100 companies, located in the southern United States. The IT teams were involved in various functional and systems task work in areas such as: network operations support, IS healthcare claims, medical informatics, project management office, intranet software development, and IS electronic imaging document management. The majority of the teams task work was performed using enterprise technology systems. The companies span several industries, which include transportation, technology and marketing services, and healthcare. Each team was asked to complete an on-line survey anonymously. The data was collected over a 60-day period. The average team size was approximately 13 (SD = 6.0).

Of the 158 participant responses, two responses were deleted due to incomplete data. Less than four percent of the data was missing; a variant of the mean substitution technique was used to replace missing values. This approach minimizes variance estimates, distribution values, and observed correlations (Hair, Black, Babin, & Anderson, 2010). The sample consisted of 156 participants. The average age of the individuals in the sample was 37.3 years; 67 percent were male; and 79 percent possessed at least a four-year college degree. The average job experience was 11.78 years, while the average team tenure was 8.5 years.

Measures

All constructs included in this study were operationalized with published scales that have demonstrated good psychometric properties in earlier studies. Unless otherwise noted, the anchors for the items were Likert-type 7- point scales with 1 indicating completely disagree and 7 indicating completely agree with the statements. A complete list of the items can be found in Appendix B.

Team emotional intelligence (TEI) was measured using the scale developed by Jordan & Lawrence (2009). As discussed earlier, this is a four-dimensional scale (awareness of own emotion- AWR, management of own emotion- MGT, awareness of others' emotions- AWRO, and management of others' emotions- MGTO) with four items for each dimension. The survey respondents were also asked to provide their team role as an identifier to their team. The respondents' role was matched with survey embedded data to ensure the respective team leader and team members were grouped properly.

Cooperative team norms measured perceptions of team norms. Five items were adapted from Chatman & Flynn's (2001) cooperative norms scale. The scale included the following statements: "It is important for us to maintain harmony within the team", "There is a high level of cooperation between team members", "People are willing to sacrifice their self-interest for the benefit of the team", and "There is a high level of sharing between team members".

Intra-team conflict was measured using six items adapted from an issue-based conflict scale (Miranda & Bostrom, 1994; Sarker & Valacich, 2010). Issue-based conflict focuses on task-related matters and helps teams develop better solutions which are appropriate for employees in a workplace (Johnson & Tjosvold, 1983). The items included the statements: "It is important for us to maintain harmony within the team", "There is little collaboration among team

members, tasks are individually delineated," There is a high level of cooperation between team members, "People are willing to sacrifice their self-interest for the benefit of the team," and "There is a high level of sharing between team members". The items were Likert-type 7- point scales with 1 indicating never and 7 indicating always with the statements.

Expertise Coordination was measured using a three dimension scale from Faraj & Sproull (2000). The scale captures the extent to which team members knew the location of expertise in their team, recognized the need for expertise, and were able to bring needed expertise to bear. The items were Likert-type 5- point scales with 1 indicating strongly disagree and 5 strongly agree.

Team performance was captured based on team members' ratings about their performance on five dimensions: work excellence, productivity, mission fulfillment, ability to resolve conflicts, and overall achievement. The five dimensions present an overall reflective measure of the individual's perception of their teams' performance related to effectiveness and efficiency.

Control variables. To account for potential rival explanations for the results, two control variables were believed to be relevant to the individual-level and team-level context. Team size was measured as reported by the team members. Prior empirical studies have shown that as team size increases, productivity per person decreases (Valacich, Dennis, & Nunamaker, 1992; Chidambaram & Tung, 2005). Chidambaram & Tung argued that when team size increases, team members feel their contribution becomes less crucial to the success of the team and result less motivation to contribute. At the individual-level, prior emotional intelligence training of the team members may perhaps act as a confound to the outcome of the study. Prior research, though limited, has shown that emotional intelligence positively impacts a number of workplace

outcomes and that training can improve one's emotional regulation (Wong & Law, 2002; McEnrue, Groves, & Shen, 2010). Both control variables were not correlated with the constructs of interest, and therefore not included in the analysis.

Validation of Scales

Various tests were performed to assess construct validity and reliability of the instrument. The Principal Component Analysis (PCA) was performed for the independent and dependent variables. A nine factor structure emerged after removing cross-loading items and items loading below .5 (Hair et al., 2010). Factors loaded onto their respective constructs except cooperative team norms. After further examination, the cooperative team norms construct was created using a surrogate variable, factor analysis technique. According to Hair et al. (2010) this technique is appropriate to overcome difficult item loadings by selecting the items with the highest factor loading to serve as a representative of that factor and subsequent analysis. This approach is based on a prior knowledge of the theory and researcher analysis. Cooperative team norms extracted 67% variance, while the other factors explain 77.94% of the total variance. Thus, the factors affirmed convergent validity and unidimensionality of the constructs. See the item loadings and cross-loading in Appendix A.

A total of 34 items were developed for the following seven constructs: 1) TEI, expertise coordination: 2) expertise location, 3) expertise needed, 4) expertise brought to bear, 5) cooperative team norms, 6) intra-team conflict, and 7)team performance. A confirmatory factor analysis was conducted with maximum likelihood estimates, using STATA 12, on these items. Item scores were standardized, and pairs of residuals for latent constructs were freed based on theory and modification indices (MIs). In the light of the causal direction being from constructs to items, and the items being highly interchangeable and correlated, reflective measures were

used (Petter, Straub, & Rai, 2007). The test of the measurement model resulted in a seven-factor structure with the 28 items loading on these factors as expected. TEI was modeled as a second-order, formative construct.

Test of Common Method Bias and Survey data

First, the multiple respondents (team leader and team members) were used for data collection to minimize the threat of common method bias. Second, a Harman's post hoc single-factor analysis was conducted to examine for method bias in the data. If common method variance is a serious issue, a factor analysis would generate a single factor accounting for most of the variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). The PCA of all 28 indicators generated for one distinct factor, and the extracted factor explained 29.16 percent of the variance. This diagnostic analysis indicates that common method bias is unlikely to be an issue with the data.

Discriminant and convergent validity indicate whether the measures of constructs are distinct and the various indicators load on intended constructs. To evaluate discriminant validity, Fornell & Larcker (1981) suggest comparing Average Variance Extracted (AVE) with the square of the correlations among the latent variables. The correlations among indicators of a construct should be greater than across constructs (See Table 2). Based on the item loadings, 7 internal consistency reliabilities (ICR) values for team emotion intelligence (second-order construct), team cooperative norms, intra-team conflict, expertise brought to bear, expertise location, expertise needed, and team performance were satisfactory (See Table 1).

To measure discriminant validity for TEI, separate analyses were conducted for each first-order construct. A test for the structural component of the TEI construct by means of second-order confirmatory factor analysis was performed (Bagozzi, 1994). TEI was tested as the

second-order factor of four first-order dimensions. The loadings of the four factor, second-order TEI construct results were AWR (.62), AWRO (.58), MGT (.48), and MGTO (.83) ($p < .01$). The global fit criteria indicate a good overall model fit: $\chi 2/df = 1.63$ ($p < .05$), comparative fit index (CFI) = 1.00, Tucker-Lewis index (TLI) = 1.04, root mean square error of approximation (RMSEA) = 0.00. The Fornell & Larcker (1981) test supported discriminant validity for each factor dimension. The fit indices clearly exceed the required minimum values and best represent the underlying theory (Hooper, Coughlan, & Mullen, 2008). The analysis revealed the four-factor TEI as a robust and parsimonious measure of TEI as a second-order, formative construct.

Much of the prior teams' research has utilized an aggregation method to evaluate team-level phenomenon (Faraj & Sproull, 2000; Lewis, 2004; Robert, Dennis, & Ahuja, 2008; Choi, Lee, & Yoo, 2010). This method mainly focuses on the homogenous behavior of the team behaviors, yet their behaviors are dynamic and changing. Thus, alternative analytic methods to understand the ways that teams affect one another's behaviors is encouraged (Murase et al., 2012; Kashy & Hagiwara, 2012).

Prior research advocates the use of the intraclass correlation (ICC), an index of the degree of similarity (dissimilarity) which measures the extent to which scores within the same group are more similar to one another than scores from different groups (Bliese, 2000; Klein & Kozlowski, 2000). This assessment of agreement has primarily been argued as a pre-requisite such that a higher level construct can be operationalized. Klein & Kozlowski (2000) suggest "when macro researchers attempt to generalize findings from aggregated data back to the lower level at which it was collected, they commit the well-known ecological fallacy"(p.213). Furthermore, the contributions of team member inputs to processes, states, and performance are less substitutable and redundant such that higher level team constructs cannot be understood

through simple linear aggregations (Murase, Doty, Wax, DeChurch, & Contractor, 2012). The statistical approach for this study utilizes robust standard errors to allow for intragroup correlation, relaxing the usual requirement that the observations be independent (STATA Corp, 2012). That is, the observations are independent across clusters (teams) but not necessarily within groups. This approach supports a compilation method where measures collected from lower-level entities combine in nonlinear, complex ways to generate a whole not just an aggregation of its constituent parts (i.e. Mathieu & Chen, 2011).

Analyses and Results

Table 1 reports descriptive statistics and bivariate correlations. Seven constructs measured by questionnaire items (TEI, team performance, cooperative team norms, intra-team conflict, and expertise coordination: expertise needed, expertise location, and expertise brought to bear). The significant correlations are noted. Team size and prior EI training were not correlated with the other variables of interest and therefore were removed from the model. A test for multicollinearity was performed. The variance inflation factor (VIF) value for each variable was 1.00 which does not surpass the threshold value of 10 (Hair et al., 2010). Multicollinearity was a not a major concern.

Table 1
Descriptive Statistics, Correlations, and AVEs

Constructs	1	2	3	4	5	6	7
1. Team Emotional Intelligence (second order construct)	**.77**						
2. Cooperative Team Norms	.40**	**.74**					
3. Intra-team Conflict	.07	.04	**.77**				
4. Expertise Brought to Bear	.21**	.43**	.10	**.82**			
5. Experistise Location	.28**	.49**	.22**	.01	**.80**		
6. Expertise Needed	.09	.27**	.04	-.15	-.18*	**.83**	
7. Team Performance	.29**	.49**	-.22**	.21**	.12	-.22**	**.88**
Cronbach Alpha	.87	.75	.81	.70	.84	.86	.94
Range of Factor Loadings	.72-.88	.77-.85	.75-.78	.88-.80	.76-.89	.80-.88	.90-.91
Composite Reliability	.85	.78	.81	.80	.84	.87	.95
Mean	5.28	5.64	3.97	4.34	4.10	2.70	5.99
Standard Deviation	.67	.82	.93	.79	.64	.92	.86
AVE	.59	.54	.60	.67	.64	.69	.78
VIF	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Number of items	16	3	3	2	3	3	4

Notes:
1. *p < 0.05; **p < .01; all other correlations are insignificant.
2. Diagonal elements are AVEs and off-diagonal elements are collecations.
3. AVE for each Team Emotional Intelligence dimension: AWR (.864), AWRO(.823), MGT(.772), MGTO(.836).

Model Fit

The STATA 12 analysis was started with the theoretical model, one exogenous latent construct and five latent endogenous constructs. In performing the statistical analysis, STATA's estimation command with the vce (*cluster clustvar*) option was used to obtain a robust variance estimate that adjusts for within-cluster correlation (Williams, 2000; Woolridge, 2006). The use of the vce command helps to validate the statistical inference about the coefficient estimates when the data distribution is not independent and identically distributed within groups (STATA Corp, 2012). In essence, the estimator improves the accuracy of the standard errors that are robust to this deviation from the standard case across the groups (i.e. teams).

The results indicate that eighty-two percent (82%) of the variance is explained by the model. The model results show team cooperative norms associated with team performance (H1) ($p <. 001$, $z=14.18$, $\beta=.91$) and cooperative team norms associated with TEI (H2) ($p < .01$, $z= 17.63$, $\beta=.90$) were supported. H1 and H2 were supported as expected and positive. The coefficient results for H1 and H2 were large, indicating a strong influence for the relationships observed.

To assess the fit of the model, an examination of the fit indices is required (Hu & Bentler, 1999; Tabachnick & Fidell, 2007; Hair et al., 2010). The results of the fit indices are presented in Table 2, which indicates a good fit.

Table 2
Model Fit Indices

Fit index	Threshold[11]	Value
NC	2.0 - 5.0	2.5
CFI	> 0.90	0.985
RMSEA	0.05-0.08	0.034
SRMR	< 0.08	0.067
TLI	> 0.95	0.983

Mediation

To test whether TEI carries influence from cooperative team norms to performance, the Sobel test was performed in STATA. The sgmediation command (Ender, 2013) in STATA 12 was performed to test the direct and indirect effect with n = 5000 bootstraps. Results from bootstrapping yielded a significant mean indirect effect of ($p < .01$, z= 20.51, β=1.45) with a 95% confidence interval from 1.31 to 1.60. H3 was supported; thus implies TEI fully mediates the relationship between TEI and performance.

Confidence intervals were computed for each indirect effect with a biased-corrected bootstrap, which is considered more reliable than the normal distribution assumed by the Sobel test (Mackinnon, Lockwood, & Williams, 2004; Qureshi et al., 2009). If the asymmetrical

[1] Normed Chi-square (NC) values between 2.0 and 5.0 are acceptable
Tucker-Lewis Index (TLI) values greater than 0.90 indicate good fit
Comparative Fit Index (CFI) values greater than 0.90 indicate good fit
Standardized Root Mean Squared Residual (SRMR) values less than 0.08 indicate good fit
Root Mean Square Error of Approximation (RMSEA) values between 0.05 and 0.08 indicate good fit

confidence interval includes zero, it implies that the indirect effect is *ns* and does not support the presence of mediation, whereas if it does not include zero, it implies that the indirect effect is significant and supports the presence of mediation (Mackinnon, Lockwood, & Williams, 2004; Shrout & Bolger, 2002). The mediation testing results are shown in Table 3.

Table 3
Results of Mediation

Variable	β	*SE*	*t*	*p*		
	Direct and total effects					
TEI will mediate the relationship between cooperative team norms and team performance	.84	.29	23.94	.00		
	Indirect Effect	*SE*	*z*	*p*	LL 95% CI	UL 95% CI
Sobel	1.45	.07	20.43	.00	6.39	7.54
Bootstrap	1.45	.07	20.51	.00	1.32	1.60

Note. N = 24 teams. Unstandardized regression coefficients are reported. Bootstrap sample size = 5, 000. LL - lower limit, CI = confidence interval; UL = upper limit.

Moderated Mediation

The moderated mediation hypothesis was tested using STATA 12. The simultaneous occurrence of both mediation and moderation in one model often referred to as moderated mediation. The Hayes (2013) and Preacher, Rucker, & Hayes (2007) provides the theoretical background and framework for moderated mediation. Moderated mediation models attempt to explain both how and when a given effect occurs (Frone, 1999). The observed effect occurs when the strength of an indirect effect is dependent on the level of some variable or when a mediated relationship is contingent on the level of a moderator. The current research focuses on intra-team conflict, expertise cooperation (expertise needed, expertise location, and expertise brought to bear) as potential moderator of the mediated relation between cooperative norms and team performance transmitted by TEI.

In the fourth hypothesis (H4), the effect of the level of intra-team conflict was moderated by the conditional indirect effect of team cooperative team norms on performance as transmitted by TEI. In other words, it is assumed that the strength of the mediated effect in the study was linearly contingent on the value of the intra-team conflict (e.g. Preacher, Rucker, & Hayes, 2007). To examine whether the mediated effects were found, bootstrap analysis was performed (n = 5000) to generate a bias-corrected and accelerated 95% confidence interval for the moderated mediation effect. The intra-team conflict was a significant moderator of the TEI indirect effect (β= .21, SE=.01, p < .00). Point estimates of each indirect effect were investigated separately (the mean, as well as 1 SD above and 1 SD below the mean.). None of the bias-corrected and accelerated 95% confidence intervals included zero. This means it can be concluded that the intra-team conflict moderated the mediation effects of the level of TEI on team performance. Post-hoc probing revealed that the conditional indirect effect decreases as the moderator intra-team conflict increases. Hypothesis 4 was partially supported. The mediated effect was weaker for teams higher on intra-team conflict than for teams lower on intra-team conflict.

In the next moderated mediation analysis, the dimensions of moderator variable expertise cooperation -expertise needed, expertise location, expertise brought to bear was examined. The same analysis was followed to evaluate these moderated mediation effects. The expertise location (β= -.22, SE=.06, p < .00), expertise needed (β= .23, SE=.08, p < .00), and expertise brought to bear (β= -.18, SE=.03, p < .00) were significant moderators of the TEI indirect effect. Point estimates of each indirect effect were investigated separately (the mean, as well as 1 SD above and 1 SD below the mean), for each moderator variable, none of the bias-corrected and accelerated 95% confidence intervals included zero. It can be concluded that the expertise

location and expertise brought to bear moderated the mediation effects of the level of TEI on team performance. In separate post-hoc probing the analysis revealed that the conditional indirect effect decreases as both moderators expertise location and expertise brought to bear increases. Therefore, H5a and H5c are partially supported. H5b is fully supported; the analysis revealed that the conditional indirect effect increases as expertise needed increases. This means more TEI behavior is exploited as the level of expertise needed goes from low to high. The results for the conditional indirect effects for each moderator variable are shown in Table 4.

Table 4

Results for Conditional Indirect Effects

Intra-conflict	Indirect effect	*SE*	*z*	*p*	95% CI
-1 *SD*	1.49	.09	17.25	.00	LL=1.31 UL=1.65
Mean	1.45	.08	19.15	.00	LL=1.30 UL=1.60
+1 *SD*	1.42	.08	17.20	.00	LL=1.26 UL=1.58
Expertise Location	Indirect effect	*SE*	*z*	*p*	
-1 *SD*	1.47	.07	20.35	.00	LL=1.33 UL=1.61
Mean	1.44	.07	20.34	.00	LL=1.30 UL=1.58
+1 *SD*	1.41	.07	19.29	.00	LL=1.27 UL=1.55
Expertise Needed	Indirect effect	*SE*	*z*	*p*	
-1 *SD*	1.40	.07	18.96	.00	LL=1.26 UL=1.55
Mean	1.44	.07	20.84	.00	LL=1.31 UL=1.58
+1 *SD*	1.49	.07	20.47	.00	LL=1.34 UL=1.63
Expertise Brought to Bear	Indirect effect	*SE*	*z*	*p*	
-1 *SD*	1.45	.09	16.41	.00	LL=1.27 UL=1.62
Mean	1.42	.08	17.23	.00	LL=1.26 UL=1.58
+1 *SD*	1.39	.08	16.97	.00	LL=1.23 UL=1.55

Note. *N* = 24 teams. Unstandardized regression coefficiens are reported. Bootstrap sample size = 5,000. LL - lower limit, CI = confidence interval; UL = upper limit.

Discussion

This study contributes to understanding TEI skills of IT teams under varying conditions to influence performance. To this end, TEI and teams literature was drawn upon to examine the moderated mediation effects involving cooperative team norms, TEI, performance, intra-team conflict and expertise coordination. This was driven by the recognition that, increasingly,

organizations are seeking ways to increase performance in their IT team-based structure where complex knowledge task work is performed. Realizing that social relationships and emotions can play a key role in how IT teams leverage their knowledge expertise coordination and intra-team conflict when exchanged for performance gains.

The results suggest that IT teams utilize their team emotion abilities to manage their interactions at all levels of intra-team conflict and expertise coordination to influence performance. Particularly, results show team members stronger in TEI abilities and higher in expertise needed were able to promote team performance better. This puts forward that if IT teams cannot recognize when specialized knowledge is needed to complete a task, teams lack a "good map" of each other's talents and skills, which can limit the exchange of information, knowledge, or sharing of skills among team members. According to Faraj & Sproull (2000), when team can recognize when and where expertise is needed is at the heart of shared interrelations. Thus, emotion management abilities may help to facilitate boundary conditions to share knowledge expertise when needed.

Table 5 summarizes the hypotheses and results.

Table 5
Summary of Findings

Hypothesis		Findings
H1:	Cooperative team norms will influence with team performance	Supported
H2:	Cooperative team norms will influence TEI	Supported
H3:	TEI will mediate the relationship between cooperative team norms and team	Supported
H4:	TEI will mediate the relationship between cooperative team norms and team performance and will be stronger for teams higher on intra-team conflict than for teams lower on intra-team conflict	Partially supported
H5a:	Expertise location will moderate the effect of TEI on performance such that the effect is stronger for teams higher in expertise location than teams lower in expertise location	Partially supported
H5b:	Recognizing expertise will moderate the effect of TEI on performance such that the effect will be attenuated for teams higher in recognition of the need for expertise than teams with lower recognition of the need for expertise	Supported
H5c:	Expertise need will moderate the effect of TEI on performance such that the effect is stronger for teams higher in expertise needed than teams lower in expertise needed	Partially supported

As evidenced in prior literature, the relationship between TEI and performance was found to be positive and significant (Edmondson, 1999; Huy, 1999; Troth et al., 2012; Joseph & Newman, 2010; Farh, Seo, & Tesluk, 2012). Hypothesis 1 is fully supported. Effective emotional intelligence strategies and inventions aimed at team behaviors can help increase the IT team's ability to exploit the constructive benefits of emotional management and awareness. The positive emotion intelligence that transmits can lead to development of enjoyable interactions among IT team members that can boost team cooperation, task work, and other team processes.

The influence of cooperative norms on TEI was positive and significant supporting hypothesis 2. In turn, TEI influenced performance of the team. The results show the behavior linkages are paramount and imply a focus for increasing IT team performance. As expected, this linkage among cooperative team norms, TEI, and team performance contributes a substantial

antecedent and consequence for IT team behaviors. The importance of emotional intelligence for IT teams is important for team performance gains.

Over the years, research has shown that emotion influences the quality of group and team interactions, the motivation of team members and team performance (Homan, 1950; Boyd, 1964; Edmondson, 1999; Mayer, Roberts, & Barsade, 2008; Troth, Jordan, Lawrence, & Tse, 2012); Joseph & Newman, 2010; Farh, Seo, & Tesluk, 2012). Team norms can become consistent over time and likely difficult to change once they have become established (Cialdini & Trost, 1998; Chatman & Flynn, 2001; Parks, 2011). A team's emergent norms can easily prevail over the abilities or behaviors of its' individual team members (Druskat & Wolff, 2008). Furthermore, confirmed in this study is how norms, a psychological phenomenon describe and explain IT team behavior (e.g. Cialdini & Trost, 1998). Understanding how EI can exist as a team-level phenomenon requires understanding how team norms emerge. The team in this study average team tenure was 8.5yrs, evidence of team interactions emerged over time. As demonstrated, team cooperative norms are fundamental and an asset for team functioning. IT teams should consistently seek to develop cooperative norm behaviors to enable shared emotion management and awareness that can lead to improved performance outcomes.

Boundary conditions were examined for the indirect effect of cooperative norms on performance at levels of expertise coordination: expertise needed expertise location, expertise brought to bear, and intra-team conflict. Unexpectedly, the indirect effect of team cooperative norms and emotional management skills significantly impacted each moderator, yet did not vary always for levels of the moderator. Though partially and fully supported, these results demonstrate the value of TEI skill as a constructive mechanism that impacts team performance in the context of IT teams. The indirect effect of TEI was significant for teams higher in the

recognition of the need for expertise than teams with lower recognition of the need for expertise. This suggests that team emotion management abilities can increase the team interactions when team members fail to seek information from one another even if they know well who has the expertise. Despite IT teams who are highly skilled and involved in complex environments, the ability of the team as a whole to secure expertise resources needed from task completion can benefit from emotional management abilities. Consistent with prior empirical findings, work-team processes and outcomes are highly influenced by team emotional context (Barsade & Gibson, 2012)

Implications and Future Research

TEI is an important mechanism that can strengthen teams' performance in the context of IT teams. These results contribute to the IS literature to understand IT teams and their emotional management abilities, and to analyze their team behaviors during IT use and task work (i.e. Beaudry & Pinsonneault, 2010). Moreover, this research effort advances how IT team emotion abilities are experienced during varying levels intra-team conflict and expertise coordination behaviors. These findings suggest that as IT organizations seek to improve team performance, team emotion ability should be considered, which can be a crucial aspect of the team interactions and performance improvement. The emotional reality of teams affords a clearer picture and provides insights to uncover how and when team emotional regulation behaviors can benefit IT teams' performance.

This study offers two valuable conclusions. First, TEI is a viable skill that enhances performance in IT teams. Second, in technology-environments, the teams' coordination can vary on levels of the expertise needed. Overall TEI skills benefit the IT team as a whole. The characteristics of TEI, awareness and management of one's and others' emotions is important to the well-being of team performance. Recognizing these specific team behaviors and how they

differ with emotion management abilities is a critical step toward increasing team performance and understanding the social cognitive skills that are essential in knowledge-intensive IT team work.

In accordance with the prior literature (Jordan & Lawrence, 2009), TEI was theorized as 4-factor model. This 4-factor model structure supports validity of the relational aspects for the construct. Not only does the results confirm prior theory (Jordan & Lawrence, 2009), but also demonstrates consistency and reliability of the measure to capture the true TEI behaviors.

The results of this study reveal several findings that have important theoretical contributions and implications for research. The study makes several theoretical contributions that hold important implications for IT teams' research in general and emotional regulation capabilities of IT teams. This research is one of the few to empirically examine in a study the effects of cooperative team norms, TEI, team performance, intra-team conflict, and expertise coordination at the team-level. Although evidence did not support moderated mediation for intra-team conflict and coordination factors: expertise location and expertise brought to bear, this study contributes to understanding team behaviors that are relevant for emotion management and awareness within IT teams. The team cooperative norms and TEI are key behaviors that organizations should emphasize for team effectiveness and efficiency.

Limitations

The sample size was small (n=24), yet rich; a larger sample of more teams might better represent the population of IT teams. However, the research theoretical model provides strong validation of theory related to prior research to interpret the findings in this study. Most importantly, this study advances prior theory to capture an overlooked aspect of team capability within collective social cognition, like TEI. Even though survey questionnaires are commonly used in the area of IT team research in their natural environment, a longitudinal study perhaps

may show deeper insights into how behavior changes over time. However, it should be noted that as a cross-sectional study, this research provides robust evidence for the relationships observed.

Future research should more closely examine the role of the TEI and cultural cognition not only team performance but also IT project performance. For instance, the impact of collection emotional ability on project performance and team processes in different type of environmental conditions, involving uncertainty and turbulence, can be investigated to understand contingencies of the emotional linkages. An interesting aspect would be to consider dynamic team knowledge transformations and dynamic cognitive structures. In particular, in the area of IS, dynamic cognitive structures are especially imperative in high-complex teams such as IS network support teams, IS security teams, and IS escalation support teams. These types of dynamic knowledge team models are in part difficult to obtain, but could provide insights into how TEI and other social cognitive behaviors evolve in response to rapidly changing knowledge exchange environments. Further research is also needed to examine cross-level effects, such as including effects of organizational- and firm-level outcomes. Such future research would provide understanding the team behaviors across different levels of the organization to potentially leverage greater competitive advantage.

In conclusion, this research sought to uncover how and when team boundary condition behaviors impact the effect of TEI on performance. The results demonstrate that the TEI skill positively influences team performance and importantly cooperative team norms are a significant antecedent. Also, this research demonstrated that emotion regulation as measured by TEI is a salient mechanism in IT teams to consider for performance gains. The emotional reality of teams does matter.

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Appendices

Appendix A

Loadings and Cross-Loadings

Construct	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9
AWR1	.10	.10	.09	**.84**	.12	.08	-.07	.13	.10
AWR2	.14	.12	.18	**.87**	.10	.09	-.05	.12	.00
AWR3	.11	.07	.31	**.72**	.05	.07	-.14	-.01	.16
AWR4	.09	.06	.11	**.86**	.11	.05	-.14	.01	-.01
AWRO1	.04	**.87**	.23	.01	.03	.19	.03	-.03	-.05
AWRO2	.05	**.82**	.21	.12	.08	.15	.08	.05	-.04
AWRO3	.04	**.87**	.13	.12	.04	.01	.02	-.05	.09
AWRO4	.03	**.82**	.29	.08	.04	.05	-.01	-.03	.03
MGT1	.23	.13	-.03	.06	.03	**.78**	.03	.06	-.10
MGT2	.22	.18	.21	-.01	-.02	**.74**	-.08	.01	.07
MGT3	-.04	.06	.14	.07	.21	**.80**	-.08	-.19	.04
MGT4	.09	.03	.01	.16	.11	**.79**	-.11	-.21	.07
MGTO1	.05	.15	**.85**	.21	.05	.09	.07	.10	.03
MGTO2	.06	.27	**.78**	.16	.05	.21	.02	.04	-.09
MGTO3	.14	.26	**.80**	.10	-.01	-.02	.11	.06	.04
MGTO4	.12	.26	**.82**	.22	.09	.07	.04	.10	-.05
CFL3	.01	-.09	.04	.07	.18	-.05	-.10	**.79**	.18
CFL4	-.07	-.07	.09	.10	.10	-.07	-.06	**.86**	.09
CFL6	-.08	.10	.11	.05	-.06	-.15	.07	**.80**	-.16
BEB2R	.11	-.06	-.04	.06	.12	.05	.02	.05	**.88**
BEB3R	.35	.11	-.02	.13	.08	-.01	-.10	.07	**.77**
EN1	-.15	.04	.17	-.08	-.12	-.11	**.79**	.05	.02
EN2	-.14	.04	.02	-.11	-.05	-.04	**.89**	-.10	.02
EN3	-.15	.04	.01	-.15	-.03	-.04	**.89**	-.03	-.12
EL2	.47	.06	.08	.04	**.77**	.08	.02	-.02	-.01
EL3	.17	.11	.10	.16	**.80**	.03	-.20	.24	.09
EL4	.38	.03	.13	.05	**.80**	.11	-.02	.01	.05
TMPerf10	**.81**	.07	.07	.15	.25	.09	-.13	-.09	.16
TMPerf6	**.83**	.05	.11	.05	.23	.14	-.15	.01	.08
TMPerf7	**.83**	.11	.10	.09	.29	.13	-.15	-.06	.11
TMPerf8	**.86**	.04	.11	.07	.12	.12	-.12	.02	.14
TMPerf9	**.82**	-.07	.01	.15	.17	.07	-.04	-.06	.03

Notes:

1. Extraction Method: Principal Component Analysis.
2. Rotation Method: Varimax with Kaiser Normalization.
3. Variance explained: 77.942

Construct	Factor 10
CN3	**.83**
CN4	**.86**
CN5	**.77**

Notes:

1. Extraction Method: Principal Component Analysis.
2. Variance explained: 67.195.

Appendix B

Item Scales

Variable Name	Survey Item
	Team Emotional Intelligence
	Awareness of emotion
AWR1	Rate each item based on your current team interactions and experiences: -I can explain the emotions I feel to team members
AWR2	Rate each item based on your current team interactions and experiences: -I can discuss the emotions I feel with team members
AWR3	Rate each item based on your current team interactions and experiences: -If I feel down, I can tell team members what will make me feel better
AWR4	Rate each item based on your current team interactions and experiences: -I can talk to other members of the team about the emotions I experience
	Management of one's emotion
MGT1	Rate each item based on your current team interactions:-I respect the opinion of team members, even if I think they are wrong
MGT2	Rate each item based on your current team interactions:-When I am frustrated with fellow team members, I can overcome my frustration
MGT3	Rate each item based on your current team interactions:-When deciding on a dispute, I try to see all sides of a disagreement before I come to a conclusion
MGT4	Rate each item based on your current team interactions:-I give a fair hearing to fellow team members' idea
	Awareness one's own emotion
AWRO1	Rate each item based on your current team interactions and experiences: -I can read fellow team members' 'true' feelings, even if they try to hide them
AWRO2	Rate each item based on your current team interactions and experiences: -I am able to describe accurately the way others in the team are feeling
AWRO3	Rate each item based on your current team interactions and experiences: -When I talk to a team member I can gauge their true feelings from their body language
AWRO4	Rate each item based on your current team interactions and experiences: -I can tell when team members don't mean what they say
	Management of other's emotion
MGTO1	Rate each item based on your current team interactions and experiences: -My enthusiasm can be contagious for members of a team
MGTO2	Rate each item based on your current team interactions and experiences: -I am able to cheer up team members when they are feeling down
MGTO3	Rate each item based on your current team interactions and experiences: -I can get fellow team members to share my keenness for a project
MGTO4	Rate each item based on your current team interactions and experiences: -I can provide the 'spark' to get fellow team members enthusiastic

	Intra-team conflict
Conflict_1	To what extent did you and the other team members disagree over alternatives?
Conflict_2	To what extent was the conflict you and the other team members experienced directly related to the task?
Conflict_3	To what extent did you and the other team members debate over some of the alternatives?
Conflict_4	To what extent did you and the other team members advocate different points of view?
Conflict_5	To what extent were the differences you and the other team members experienced task-related?
Conflict_6	To what extent did you and the other team members disagree over alternative solutions proposed?
	Expertise Coordination
	Expertise Location
EL_1	Rate each item based on your current team interactions and experiences: -The team has a good ‘‘map” of each other’s talents and skills
EL_2	Rate each item based on your current team interactions and experiences: -Team members are assigned to tasks commensurate with their task-relevant knowledge and skill
EL_3	Rate each item based on your current team interactions and experiences: -Team members know what task-related skills and knowledge they each possess
EL_4	Rate each item based on your current team interactions and experiences: -Team members know who on the team has specialized skills and knowledge that is relevant to their work
	Expertise Needed
EN_1	Rate each item based on your current team interactions and experiences:-Some team members lack certain specialized knowledge that is necessary to do their task
EN_2	Rate each item based on your current team interactions and experiences:-Some team members do not have the necessary knowledge and skill to perform well--regardless of how hard they try
EN_3	Rate each item based on your current team interactions and experiences:-Some people on our team do not have enough knowledge and skill to do their part of the team task
	Bring Expertise to Bear
BEB_1	People in our team share their special knowledge and expertise with one another
BEB_2R	If someone in our team has some special knowledge about how to perform the team task, he or she is not likely to tell the other member about it
BEB_3R	There is virtually no exchange of information, knowledge, or sharing of skills among members
BEB_4	More knowledgeable team members freely provide other members with hard-to-find knowledge or specialized skills

	Team Collaborative Norms
CN1	Rate each item based on your current team interactions and experiences:-It is important for us to maintain harmony within the team
CN2	Rate each item based on your current team interactions and experiences:-There is little collaboration among team members, tasks are individually delineated
CN3	Rate each item based on your current team interactions and experiences:-There is a high level of cooperation between team members
CN4	Rate each item based on your current team interactions and experiences:-People are willing to sacrifice their self-interest for the benefit of the team
CN5	Rate each item based on your current team interactions and experiences:-There is a high level of sharing between team members
	Team Performance
TMPrate1	To what extent do you agree that your team performed well in terms of the following:-Efficiency
TMPrate2	To what extent do you agree that your team performed well in terms of the following:-Quality
TMPRate3	To what extent do you agree that your team performed well in terms of the following:-Technical innovation
TMPrate4	To what extent do you agree that your team performed well in terms of the following:-Adherence to schedules
TMPrate5	To what extent do you agree that your team performed well in terms of the following:-Adherence to budgets
TMPRate6	To what extent do you agree that your team performed well in terms of the following:-Work excellence
TMPRate7	To what extent do you agree that your team performed well in terms of the following:-Productivity
TMPRate8	To what extent do you agree that your team performed well in terms of the following:-Mission fulfillment
TMPRate9	To what extent do you agree that your team performed well in terms of the following:-Ability to resolve conflicts
TMPRate10	To what extent do you agree that your team performed well in terms of the following:-Overall achievement

Appendix C

Research Compliance

Office of Research Compliance
Institutional Review Board

October 16, 2013

MEMORANDUM

TO:	Mary Dunaway Fred D. Davis Paul Cronan
FROM:	Ro Windwalker IRB Coordinator
RE:	New Protocol Approval
IRB Protocol #:	13-10-157
Protocol Title:	*Understanding the Relation between Team Norms, Team Emotional Intelligence, and Behaviors*
Review Type:	☐ EXEMPT ☒ EXPEDITED ☐ FULL IRB
Approved Project Period:	Start Date: 10/15/2013 Expiration Date: 10/10/2014

Your protocol has been approved by the IRB. Protocols are approved for a maximum period of one year. If you wish to continue the project past the approved project period (see above), you must submit a request, using the form *Continuing Review for IRB Approved Projects*, prior to the expiration date. This form is available from the IRB Coordinator or on the Research Compliance website (http://vpred.uark.edu/210.php). As a courtesy, you will be sent a reminder two months in advance of that date. However, failure to receive a reminder does not negate your obligation to make the request in sufficient time for review and approval. Federal regulations prohibit retroactive approval of continuation. Failure to receive approval to continue the project prior to the expiration date will result in Termination of the protocol approval. The IRB Coordinator can give you guidance on submission times.

This protocol has been approved for 250 participants. If you wish to make *any* modifications in the approved protocol, including enrolling more than this number, you must seek approval *prior to* implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

If you have questions or need any assistance from the IRB, please contact me at 210 Administration Building, 5-2208, or irb@uark.edu.

IV. Explaining Affective Linkages in IT Teams: An exploratory lab study

Introduction

In today's reality, task work in Information Systems (IS) is more interdependent and global. The use of teams is needed at all levels in the organizational hierarchy to work collaboratively and efficiently toward solving complex problems. Teams are the most common work structure used in most companies. The concept of emotional intelligence has been proposed by several theorists as a framework integrating aspects of emotional information processing, emotion regulation, and behavioral response during team interactions (Kelly & Barsade, 2001; Goleman, Boyatzis, & McKee, 2002; Ashkansay, 2003; Jordan & Troth, 2004; Druskat & Wolff, 2008; Jordon & Lawrence, 2009). Emotions behaviors can influence IS task work in activities such as decision-making, problem-solving, and interpersonal interactions (Cenefetelli, 2004; Beaudry & Pinsonneault, 2010; Caya, Brunelle, Léger, & Grebot, 2012b; Ortiz de Guinea, 2013; Léger, Riedl, vom Brocke, 2014). Because affect (emotion) in organizations is connected with rationality and reasoning it important to understand how collective emotion linkages form and may benefit team performance outcomes. Prior research has mostly focused on emotion as an individual-level phenomenon. However, recent attention has focused on collective emotion with an understanding that interpersonal functions of affect can emerge at the team level through interactions (Keltner & Haidt, 1999; Kelly & Barsade, 2001; Barsade & Gibson, 2012).

Such interactions serve to intensify and regulate individual team member emotion to converge at the team-level and behave in ways different than they would on their own (Barsade & Gibson, 2012). Much of the literature that examines the individual-level emotion finds influence on IS work-related attitudes, use, and behavior (Beaudry & Pinsonneault, 2010; Ortiz

de Guinea & Webster, 2013). Lacking is research that takes into account that teams, who are the building blocks of organizations, are much scarcer. Fortunately, emotion-related research that takes on a team-level perspective is beginning to emerge (Barczak, Lassk, & Mulki, 2010; Ghosh & Shuck & Petrosko, 2010; Caya et al., 2012b; Farh, Seo, & Tesluk, 2012; Léger, Riedl, & vom Brocke, 2014).

Team emotion is formed as a result of *emotional convergence* among team members (Kelly & Barsade, 2001). At the individual level, implicit and explicit mechanisms combine to form the affective composition of the team. These individual-level affective experiences are shared and spread among the team members. Implicit emotion mechanisms refer to affective processes activated or processed outside of the conscious awareness to influence the ongoing behavior, and conscious emotional experience (Barsade, Ramarajan, Westen, 2009). Applying the Barsade, Ramarajan, & Westen conceptualization, such emotions can occur in a team after initial emotion exposure to a team member and then the team member(s) engages in unconscious, rapid mimicry, and synchrony of facial, postural, and vocal movements. In contrast, explicit emotion mechanisms individuals occur when individuals are not necessarily aware that the process of emotional sharing is occurring (Kelly & Barsade, 2001). For example, this can occur when team members whose activities attempt to influence the effect of another team member through surface-level emotional displays to fit in, or gain other rewards from their team members.

The emotional mechanisms and cognitive processing that occur are trigged by automatic neurons that respond as experienced by one team member and transferred to another team member (i.e. Barsade, Ramarajan, & Westen, 2009). Many studies show that emotion transmitted among team members may actually establish emotion states that are sufficiently

homogeneous and recognizable to be treated as a collective property of the team (Kelly & Barsade, 2001, Totterdell, Kellett, Teuchmann, & Briner, 1998; Peslak, 2005; Elfenbein, Polzer, & Ambady, 2007) and the team emotion can vary either negatively or positively. More importantly, the team emotion sharing mechanisms can influence the TEI (Kelly & Barsade, 2001).

TEI refers to the outcome of the individual-level emotions shared among team members. In other words, TEI is the "emotional awareness and emotional management abilities of the team" (Jordan & Lawrence, 2009, p. 454). Despite the apparent relevance of the topic, there is little insight into the emergence of the implicit and explicit team behaviors. Recently, NeuroIS, a research domain, offers an approach to gain deeper insights into behavior using neurophysiological tools and cognitive neuroscience literature to inform the IS literature (Dimoka, Pavlou & Davis, 2011). This new domain proposes to integrate cognitive neuroscience, IS design and behavioral science, and human-computer interaction. Cognitive neuroscience brings to IS researchers the theories and tools to uncover the neural bases of cognitive, emotional, and social processes. Neurophysiological tools provide a way to measure behaviors to capture hidden processes, antecedents of the IS constructs, test consequences, and challenge IS assumptions. These type tools can complement IS research and provide more reliable data over traditional methods such as self-report or archival that may be difficult or impossible to obtain (Dimoka et al., 2012). On the contrary, these tools can be unreliable if collected and used improperly (i.e. Picard, 1997; Westerink, van den Broek, Van Herk, & Tuinenbreijer, 2008).

The data obtained are generally not susceptible to subject bias, demand effects, and social desirability biases. More importantly, neurophysiological data are advantageous because real-

time measurement allows continuous monitoring of a subject while executing or responding to a specific stimulus (Dimoka, Pavlou, & Davis, 2011). Researchers benefit from a temporal precision that allows one to match the task or stimulus to the neurophysiological response virtually in real-time, thus enriching the understanding of relationships among the IS constructs. Several empirical studies have begun to investigate team emotion using neurophysiological tools and these studies offer great promise (Loos, Riedl, Müller-Putz, vom Brocke, Davis, Banker, & et al., 2010; Léger et al., 2010; Caya et al., 2012b; Léger, Riedl, & vom Brocke, 2014).

The aim for this exploratory study is to examine: 1) affective linkages in team emotion 2) implicit and explicit mechanisms of team emotion to explain causality of teams' emotional intelligence, and 3) how well do neurophysiological tools measure implicit facial emotion in team that may complement their self-report explicit emotion. The focus of this study is to explain the emergent implicit and explicit affective linkages in team emotions. To offer a more complete explanation of these relationships, neurophysiological and self-report measures are captured in an exploratory laboratory study to examine the implicit and explicit shared emotion processes, and TEI. Combined for this study are electro dermal activity (EDA) and facial recognition technology to capture implicit team behaviors. Causal effect linkages will be examined in IT Teams through observed enterprise technology use. To date, no other studies have attempted to examine the team-level emotional emergence in this manner.

IT Teams

IT Teams provide the social context and technology interaction in which to study this phenomenon. IS research is increasingly acknowledging the important role that contextual factors beyond the individual impact emotion technology-related behavior. For instance, Gallivan, Spitler, & Koufaris (2003) highlight the need for research to incorporate "influences at

levels beyond the individual user that shape how employees use IT in their jobs" (p.155). These authors assert that such influence could exist at the level of the workgroup (i.e. team). Increasingly, IT scholars have placed emphasis on understanding the role of emotion as a determinant of technology use behavior, interpersonal exchange, and performance for organizations (Venkatesh, 2000; Beaudry & Pinsonneault, 2010; Dimoka, Pavlou, & Davis, 2011; Ortiz de Guinea & Webster, 2013; Stieglitz & Dang-Xuan, 2013; Tsai & Bagozzi, 2014).

IT scholars have argued situational characteristics may have direct impacts on IT usage and characteristics of the users, and therefore are of great importance to IS researchers (Hevner, March, Park, & Ram, 2004; Hong et al., 2014). For example, Boiney (1998, p.343) suggested that "the same technology will not provide the same results with each group and in each setting". Furthermore, Gopal & Prasad (2000, p. 512) brings to our attention that "technology cannot be studied outside its social context and that inconsistent results may be directly related to our lack of attention to this fact".

IT Teams that use enterprise technology systems is the context for this study. Enterprise technology systems integrate business processes and provide access to integrated data across a company's enterprise (Davenport, 1998; Markus & Tanis, 2000). Enterprise technology systems such as Enterprise Resource Planning (ERP) systems are commonly implemented in a company to support their functional and operational aspects of their business (Gattiker & Goodhue, 2005). For IT Teams who use enterprise technology, their task work is highly interdependent, informative for managerial decision-making, and the enterprise technology is one of the most important investments of a company (Markus & Tanis, 2000). According to the Hollenbeck, Beersma, & Schouten, 2012, advances three underlying constructs that emerge as the taxonomy to differentiate teams for theorizing. The constructs are skill differentiation, authority

differentiation, and temporal stability which are crucial categories that can describe teams of various types. Skill differentiation describes the degree to which team members have specialized knowledge or functional capacities that make it more or less difficult to substitute team members. Authority differentiation refers to the degree to which decision-making responsibility is vested in individual members, subgroups of the team, or the collective as a whole; and temporal stability is the degree to which team members have a history of working together in the past and an expectation of working together in the future. The common skills possessed by a team promote flexibility through the team member substitutability and also facilitates consensus-building for decision making. Enterprise technology teams differ from other types of technology teams due to their unique skill differentiation (e.g. Hollenbeck, Beersma, & Schouten, 2012), thus are deemed important to study.

The integration of past research has shown types of tasks and the task difficulty as predictors of team homogeneity (Bowers, Pharmer, & Salas, 2000; Roberts, Cheney, Sweeney, & Hightower, 2004; Strong & Volkoff, 2010; Chae, Seo, & Lee, in press). Different types of tasks require different levels of coordination and teamwork, and distinct differences in performance on types of tasks can therefore be expected (Bowers, Pharmer, & Salas, 2000). The difficulty of the task determines the resources that a team must use in performing a task. Consequently, the cognitive and emotional resources may vary depending on the task difficulty level.

Theory

Social capital theory is rooted in the significance of relationships as a resource for social action (Baker, 1990; Burt, 1992; Coleman, 1988, 1990; Nahapiet & Ghoshal, 1998) and in particular IT Teams (Robert Jr., Dennis, & Ahuja, 2008). As organizations are comprised of knowledge systems, their social capital can become their "organizational advantage" (Nahapiet

& Ghoshal, 1998). Lawler (1992) posits that emotion is the essential social process in group (i.e. team) formation and maintenance. Because positive emotions strengthen feelings of control, positive emotions are a necessary precursor of team cohesiveness, effectiveness, and satisfaction (George & Brief, 1992; Ashkanasy, 2003).

Kelly & Barsade (2001) introduced the importance of how team emotions arise from implicit and explicit mechanisms through which the team emotions are shared. Their comprehensive model demonstrates implicit and explicit mechanisms in bottom-up and top-down components to form teams' emotion. These components refer to collective emotion that result from both the combinations of individual-level affective factors that each team member possesses as well as from the team- or contextual factors (e.g. IT use) that define or shape the affective experience of the team. Implicit mechanisms include automatic transfer processes such as emotional contagion, vicarious affect, behavioral entrainment and interaction synchrony (the tendency for team members to automatically adjust their behavior to synchronize with other members' behavior. Explicit mechanisms are more socially induced and deliberate emotional experience created among team members.

Bottom-up components refer to a variety of affective composition effects (i.e. TEI) team members bring with them into the team interaction. For example, individuals bring to the team emotional experiences such as dispositional affect, moods, emotions, emotional intelligence, and sentiments. Top-down affect context imposes an affective tone on the team to amplify or constrain how the team experiences or expresses their emotion. Types of affective context can include team emotional history, team emotional norms, and other context. IT team context can include IT task work (White, 1984; Piccoli & Ives, 2003; O'Leary & Cummings, 2007); IT processes (Tanriverdi, Konana, & Ge, 2007), and IT job design (Li, Hsieh & Rai, 2013).

Accordingly, Kelly & Barsade's (2001) framework for collective emotion combines the top-down and bottom-up components which can lead to the team emotion at any given point through their interactions. However, little attention has been given to empirically examining these affective linkages in IT teams.

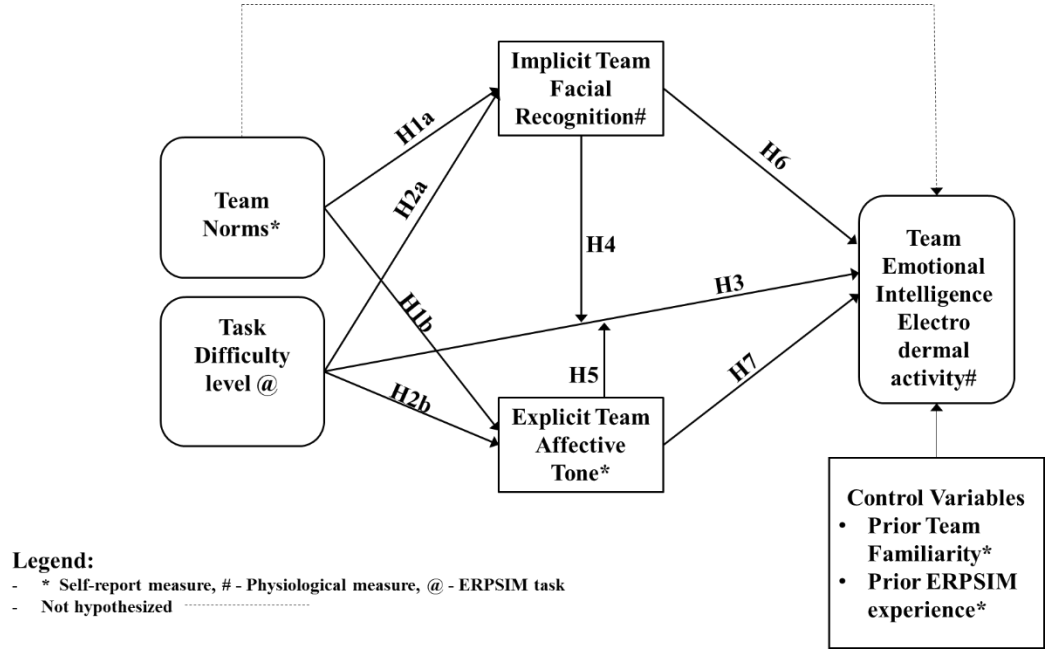
Literature Review and Hypothesis Development

Affect permeates teams within the organization. The interdependent relationships and interactions among the team members are present in task work. Affective processes more commonly known as emotions create and sustain work motivation (Brief & Weiss, 2002). While much about emotion is difficult to explain, progress has made to establish a framework to understand how individual emotions emerge to form team emotion (Kelly & Barsade, 2001). Yet, little is known about how the team explicit and implicit emotion processes evolve and emerge in teams.

The affect is elicited by a particular target or cause, often physiological reactions and action sequences, and is relatively intense and short-lived (Frijda, 1986; Lazarus, 1991). Because emotions are focused on a specific target or cause, they are regarded as discrete, and are linked to specific tendencies to act (Frijda, 1986). Prior research in a comprehensive meta-analysis found that the tendency to experience positive emotions is associated with a variety of work performance measures, such as more positive supervisory evaluations, higher income, enhanced negotiating ability, and performance discretionary acts for the benefit of the organization (Lyubomirsky, King, & Diener, 2005). Izard (2009), a leading scholar in emotion theory, has theorized that exists are many identified unresolved issues in relation to phenomenal consciousness and the psychological unconscious, their similarities and differences. Moreover, emotions differentially influence strategic approaches and solutions in problem-solving tasks (Fiedler, 2001; Isen, Daubman & Nowicki, 1987; Caya et al., 2012b).

The outcome of individual-level shared emotions is the teams' affective composition or the teams' emotional intelligence (Kelly & Barsade, 2001). The affective contexts in which the implicit and explicit processes operate are shaped by a top-down and bottom-up approach. The top-down approach (affective context) emerges at the team-level and is felt by team members influenced by team norms and task difficulty-level context. The top-down and bottom-up approaches are paired to explain the emotion processes and emotion regulation in teams. Based on the discussed conceptualization of team emotion emergence, Figure 1 shows the theoretical model to be evaluated.

Figure 1 Theoretical Model



Team Implicit and Explicit Emotion Processes

The emotion experiences are distinct (Barrett, Gross, Christensen, & Benvenuto, 2001), yet the emotion regulation can be inter-related (Gyurak, Gross & Etkin, 2011). Gyurak, Gross & Etkin propose a dual framework of implicit and explicit regulation which suggests that the two regulation processes are not mutually exclusive categories, but rather have porous boundaries.

That is, the regulation processes may vary in explicitness or implicitness over time or across situations, and the adaptive emotional responses are dependent on the extent of the implicit and explicit processing.

Implicit emotions processes are hard to detect, automatic, and subconscious. These processes are activated or processed outside of conscious awareness and can influence ongoing thought, behavior, and conscious emotional experience. In contrast, explicit emotion processes focus on emotional sharing that occurs with deliberate intent and direct manipulation of the emotion is spread to other team members (Kelly & Barsade, 2001).

Team Norms

The affective context serves as boundary conditions for the emotion based team-level forces acting on a team. A significant part of a team's context develops from the collective assumptions, beliefs, norms, practices and the team members' physical proximities. These aspects deepen the team members' understanding of the emotional patterns and subsequent behavioral display of emotions (e.g. Ekman, 1973; Barsade & Gibson, 2014). The teams' affective context influences individual-level, implicit and explicit processes to amplify or constrain how a team experiences or expresses emotion (Kelly & Barsade, 2001). The affective context that governs the individual- level emotions serves as the antecedent to the emotion sharing processes that can spread among team members.

No team can easily exist without established norms (Parks, 2011). Team norms are guidelines for acceptable and unacceptable behavior that develop through interactions among group members and are informally agreed on by group members (Cialdini & Trost, 1998). Some are actively transmitted (e.g., explicit statements, rituals) whereas others are passively transmitted (e.g., nonverbal behaviors, imitation). The teams' emotional norms emerge as

patterns of behavior that can influence and build emotional capacity, develop social capital and lead to effectiveness (Druskat & Wolff, 1999). Norms have a strong influence on team-based behavior and are difficult to change (Parks, 2011). Prior research suggests team norms are tightly coupled with the effects of the emotions and linked to team performance (Wolff et al., 2006; Koman & Wolff, 2008) and team problem-solving behavior (Taggar & Ellis, 2007)

Norms are beneficial to the team functioning because they: a) facilitate team survival and keep the team together, b) provide regularity and predictability to the behavior expected from team members, c) avoid potential interpersonal problems among team members, and d) clarify the teams' distinctive nature (Feldman, 1984). Thus, team norms represent a proactive approach toward dealing with team problems and contribute to team performance. Teams without norms would be chaotic and disordered because there would be no boundaries for proper behavior.

In conditions of high interdependence, such as IT Team problem-solving, the absence of strong norms detracts from team effectiveness and performance (i.e. Taggar & Ellis, 2007). In the early stages of team formation, team members' feelings of uncertainly in regard to expected action are eased as communication flows to clarify appropriate behaviors (Colman & Carron, 2001). Through discussion, team members propose norms giving rise to obligations that reflect the team member's relationship with each other and the team as a whole (Shore & Barksdale, 1998). Thus, it is hypothesized team norms will positively influence implicit and explicit team emotion processes.

H1a: Team norms will positively influence team implicit emotion processing

H1b: Team norms will positively influence team explicit emotion processing

Team Emotion and Task difficulty

Performance is conditional upon the kind of task that has to be performed (Fransen, Kirchner, & Erkens, 2011; Dierdoff, Bell, & Belohav, 2011; Puck & Pregernig, in press). When the type of task and its difficulty level to be performed are combined, their combination may determine how emotion influences performance. For instance, an IS developer team performs best when being analytical and attentive to details, whereas an art media team performs best when being creative and innovative. As a consequence, the effects of emotion on performance depend upon the task demands (i.e. Weiss & Cropanzano, 1996). Applying the same rationale for individuals to the team-level, it can be assumed that teams' emotional intelligence and their collective emotion will depend on the task and task difficulty performed. Therefore, it is expected task difficulty will positively influence TEI.

Léger, Riedl, & vom Brocke (2014), argued that previous managerial exposure to an enterprise system (i.e. ERP) not only changes the perspective of the individual, but also may alter the emotional conditioning related to the enterprise system. Specifically, their empirical study showed that the enterprise system task work enables the individual to feel more in control of using the enterprise system data to make better decisions.

Chae, Seo, & Lee (in press) find that team task difficulty level is important for knowledge exploration and exploitation. Specifically, when teams engage exploration and exploitation of their knowledge resources they are able to expend their knowledge into their task work. The authors suggest that when attempting to maximize team performance, task difficulty should be taken into consideration. Task difficulty is not only important when designing and developing a task, but also when evaluating task results. Furthermore, Marshall & Brown (2004) advance that task difficulty plays an important role in the relationship between expected and

actual performance. Knowledge behaviors in enterprise technology teams can be impacted by their emotion. Caya et al., 2014b, found that the relationship between team knowledge sharing behaviors on performance is negatively affected by their level of team emotion variability. Thus, it is likely that task difficulty level can play a role in the emotion processing of teams during IT task work and team performance. It is hypothesized that task difficulty level will positively influence TEI, implicit and explicit team emotion processing.

H2a: Task difficulty level will positively influence team implicit emotion processing

H2b: Task difficulty level will positively influence team explicit emotion processing

H3: Task difficulty level will positively influence TEI

Team Implicit Facial Recognition

Because the face is the primary canvas used to express distinct emotions nonverbally (Ekman, 1965), the ability to read facial expression is particularly vital, and a crucial component of emotional intelligence (Elfenbein, Marsh, & Ambady, 2002). The facial expressions are normally interpreted from the situation precipitating the expression, concurrent verbal messages, and other information likely to affect expectations, and thus the interpretation of the expression.

Implicit facial recognition processes occur in teams primarily when emotions are transferred subconsciously and automatically to nearby team members (i.e. Kelly & Barsade, 2001). For example, team members who interact through emails and "chats" are affected by the other team member emotions without being able to perceive the non-verbal cues. Consequently, their affective state matches other team members' emotional display. This tendency among teams occurs automatically to synchronize expressions, vocalizations, postures, and movements of another team member, and consequently converge emotionally (Hatfield, Cacioppo, & Rapson, 1992). Because the emotion transmission can occur subliminally fast, teams seem

unaware and not able to track how swift and complete are the expressive behaviors and emotions of others. Thus, the emotion transmission among team members becomes harder to detect and report upon.

In some contexts, implicit facial recognition can lead to positive outcomes. Barsade (2002) found on a simulated managerial group decision-making task the extent that individuals within the group experienced positive contagion predicted how positively other group members rated their performance. Positive implicit facial recognition led to improved cooperation, decreased conflict, and increased perception of task performance. For example in a natural setting, Illies, Nahrgang, & Morgeson (2007) found emotional contagion was stronger for people who had a higher dispositional propensity toward emotional contagion, and also for those who had more collectivistic tendencies toward the team. Strong evidence was found for unintentional emotional contagion beyond dyads (Dezecache et al., 2013). Neurophysiological evidence (electromyographic, facial muscles, skin conductance response) measures show that when one is tuned to react to others' emotional signals and unintentionally produce sufficient emotional cues may induce emotional states in others. This finding support suggests support for implicit facial recognition at the team or group level. Lishner, Cooter, & Zald (2008) results suggests emotional expression as measured by facial muscle activity after strong prescribed stimuli appears to reflect expressive congruence with observed expression and a response indicative of the amount of cognitive load necessary to interpret the observed expression. Such implications imply cognition may lead to emotion, and perhaps the subconscious which can be applied to IS teams. Recognition of facial expression is a useful component of TEI and can be valuable within the context and adaptive environment evaluated (Elfenbein, Marsh, & Ambady, 2002). The facial expressions as precipitated by the expression, concurrent verbal messages, and other information

will likely affect expectations and the interpreted meaning of an expression. It is hypothesized that positive team implicit facial recognition processes will moderate the relationship between task difficulty level and TEI.

H4: Positive team implicit facial recognition mechanisms moderate the relationship between task difficulty and TEI

Team Affective Tone

Affective tone is behavior characterized through explicit processes where high similarities of consistent or homogeneous affective reactions are experienced within a team (George, 1990; Collins, Lawrence, Troth, & Jordan, 2013). Collins et al. (2013) meta-analysis finds that few studies have empirically examined how affective tone develops in teams. A team's affective tone is an important aspect of team interactions and the processes that emerge into a team emotion. In the broader perspective in the teams' literature, scholars argue that collective affective tone possesses highly dynamic properties that potentially change as the interaction patterns among team members change (Cronin, Weingart, & Todorova, 2011; Collins et al., 2013). For example, individuals within a team may encounter a positive response to some event (i.e. successful completion of an IT task), to which team members are likely to respond in an affective similar way (e.g. all team members are excited about the teams' success). Moreover, organizational emotion norms, team norms, and emotional history can play a salient role to promote the affective convergence between members of a team (e.g. Kelly & Barsade, 2001).

Team affective tone can be either positive or negative and has been shown to influence various work outcomes such as organizational spontaneity (i.e. George & Brief, 1992) and absenteeism (i.e. George, 1989). Tanghe, Wisse, & Van Der Flier (2010) found that perceived team performance was contingent on positive team affective tone when team identification was higher. Teams high in identification have team members whose self-conception is affected not

only by an individual's unique personal characteristics, but also their membership in a social group, such as work groups, teams, or organizations (e.g. Abrams & Hogg, 1988; Taifel & Turner, 1986; Turner, 1985). Higher positive affective tone has been linked to better coordination (Sy, Côté, & Saavedra, 2005) as well as greater cooperation and less group conflict (Barsade, 2002). Teams' positive affective tone has also been linked to teams' performance such that a greater positive affective tone is predictive of better team performance when self-rated (Barsade, 2002; Tanghe et al., 2010), supervisor-related (George, 1995; Kim & Choi, 2012) and objective performance (Hmieleski, Cole, & Baron, 2012).

There is less evidence of the detrimental effects of negative affective tone on performance. Negative affective tone was found to distract team members from task completion within manufacturing teams (Cole, Walter, & Bruch, 2008). Furthermore, the negative affective tone was associated decreased performance (rated by supervisors), and this effect was moderated by the teams' nonverbal negative expressivity. Consequently, the teams were not free and open in there nonverbal expression of negative affect. Also, higher negative team affective tone has been found to be influenced by different types of conflict (e.g. Gámero, González-Romá, & Peiró, 2008; Sessa, 1996). According to Collins et al. (2013), emerging theories and research that advance the influence of team affective tone on team outcomes is more complex than in earlier research on this topic, such that team task characteristics may play a moderating role in these relationships. As a consequence, IS task work can be leveraged and offers contextually specific differences from other team types to provide understanding about teams' emotional emergence. It is hypothesized that team positive affective tone moderates the relationship between task difficulty level and TEI.

H5: Positive team affective tone mechanisms moderates the relationship between task difficulty level and TEI

Team Emotional Affect and TEI

Team affect is formed as a result of emotional convergence among the team members (Kelly & Barsade, 2001). Each team member's emotion is transmitted by implicit and explicit processes where their emotional composition combines to form the team collective emotion. The team members may experience in varying levels positive or negative emotion (valence) or high or low emotion (arousal) in response to events or stimuli that when transmitted through facial recognition (explicit) and affective tone (implicit) processes lead to collective emotion. Thus, a team may be characterized as being composed of team members who uniformly feel more or less similar in regards to their affective state.

This is particularly true in highly interdependent teams in which success or failure at the task is shared by all members of the team. Because teams work closely and share many of the same task elements, instances of frustration or difficulty could influence the collective emotion of the team and impact their performance. In particular, research suggests that "people are hard-wired to pick up emotional signal from others" (Côté, 2005, p. 515) and the individuals' social stimulus (Elfenbein, Marsh, & Ambady, 2002).

Electrodermal activity (EDA) is engaged in this study to assess skin conductance response (SCR), a neurophysiological measure to capture TEI implicit measures. EDA measures electrical skin conductance which can vary with the amount of sweat produced from the eccrin sweat glands (Boucsein, 2012). This process is controlled by the sympathetic division of the autonomic nervous system and widely used in the literature as an objective measure of emotional arousal and emotional regulation monitored in an unobtrusive manner (Bradley, Lang, & Cuthbert, 1993; Lang, 1995). EDA refers most generally to all (passive and active) electrical phenomena in the skin; SCR is a type of EDA. Measures of EDA are distinguished based on the

technical aspects of the assessment. EDA recordings that do not use an external current are called endosomatic, which records an external current (such as SCR). Exosomatic techniques are further distinguished by a direct current (DC) or an alternative (AC). SCR is type of DC measurement where the voltage is constant.

Many studies have used SCR to measure individual-level emotion effects (Pecchinenda & Smith, 1996; Figner & Murphy, 2010; D'Mello, Lehman, & Person, 2010; Westerink et al., 2008; Zysberg, 2012), yet few studies were found where EDA type measures (Tanghe et al., 2010; Caya et al., 2012a, 2012b; Salminen et al., 2013) and facial recognition (Gorbunov, 2013) of emotion to measure team-level emotion effects. Recent research has begun to use EDA to measure team-averaged emotional experiences as reflected in task engagement (Schwartz & Shapiro, 1973; Pecchinenda & Smith, 1996; Westerink et al., 2008; Benedek & Kaerback, 2010, Caya et al., 2010a, 2012b; Léger, Riedl, & vom Brocke, 2014).

Evidence has shown that EI may have origins in underlying biological and physiological systems and process relevant to psychological adjustment. Specifically, EI seems to associate with the experience and management of emotion (Craig et al., 2009). Both theoretical and empirical evidence strongly relates EI to aspects of emotional regulation (Austin, 2005; Mayer, Caruso, & Salovey, 1999; Wong & Ang, 2007). This evidence suggests that EI and physiological indices of emotional response and regulation are meager and focuses mainly on two directions: 1) associations between EI and physiological reactions to stress, mainly perception of arousal and stress (Boucesin, 2012; Dawson, Schell, & Filion, (2007) and 2) brain activity patterns (Craig et al., 2009; Heinzel & Northoff, 2009). Prior literature has established EDA as a physiological indication of emotional arousal and thus serves to assess emotional regulation (Benedek & Kaerbach, 2010; Kindermann, Auinger, & Javor, 2013; Caya et al., 2012b; Léger,

Riedl, & vom Brocke, 2014). Thus, these associations of EI, efficient processing, and regulation of emotional responses at the physiological level is important and warrants more examination.

In particular, this evidence provides a foundation in which to study and utilize EDA to capture and advance understanding of EI at the team-level. Zysberg (2012) advanced that higher levels of EI (individual-level) will associate with more efficient emotional regulation as reflected by EDA. The findings show that EDA measures were associated with EDA delta (stimulus response-baseline) scores, while the self-report measure of EI and other demographics (e.g., gender, ethnicity) did not show associations with the outcome measures. Raz, Dan, Arad, & Zysberg (2013) examined the behavioral and neural correlates of EI as an Event-Related Potentials[2] study. Their results revealed a significant interaction effect with the valence and EI group; findings show valence ratings were lower for unpleasant pictures and higher for pleasant pictures in the high EI group when compared with the low EI group. The groups did not differ with respect to neutral picture ratings.

One of the most common frameworks in the emotions field proposes that affective experiences are best characterized by two main dimensions: arousal and valence. EDA is an indicator of arousal (or emotion). The composition of affect is well structured as a circumPlex (Russell, 1980). The circumPlex model captures the level of the emotional state. The extent of an arousal is measured by individual differences in the tendency to attend to and to report the physiological arousal associated with an effective state. The dimensions of valence are individual perceptions of emotion ranges from highly positive to highly negative. The dimension of arousal ranges from high to low on the circumPlex as calming or soothing, to exciting or agitating.

[2] Event-Related Potential studies measure brain response that is the direct result of a specific sensory, cognitive, or motor event

Variations in the valance and arousal components of the circumflex predict the observed correlations between measures of any aspects of the affective space. The physiological measures are more objective and provide greater accuracy of the team emotion processes. Recent studies have validated the psychological significance of "spontaneous" or "nonspecific" EDA produced during team performance of complex problem-solving tasks (Caya et al., 2012b; Léger et al., 2014).

Several studies have reported that relative resting levels, increases in the SCR level and rate of nonspecific responses are reliably associated with the performance of problem-solving tasks (Pecchinenda & Smith, 1996; Caya et al., 2012a) and emotional awareness (Westerink et al., 2008). Moreover there have been indications that the magnitude of these increases varies with task difficulty. Salvia, Guillot, & Collet, (2013) examined the skin resistance levels associated with performing mental arithmetic at three levels of difficulty, and found that skin resistance decreased (i.e. that skin conductance level increased) as difficulty increased. In addition, Bohlin (1976), Eason & Dudley (1971), and Steptoe, Moses, Mathews, & Edwards (1990) have compared easy versions of a task (i.e. passively attending to the relevant task stimuli) with more difficult versions (i.e. actively performing a vigilance or problem-solving task), and in each case increased skin conductance activity in the difficult conditions relative to the easy tasks. Furthermore, the relationship between the team members' ability to cope under stressful problem-solving situations and task engagement has received strong support using EDA (skin conductance) measures (Caya et al., 2012b; Léger, Riedl, & vom Brocke, 2014).

Based on the literature concerning team affect, the sharing processes implicit and explicit experiences lead to the affective composition of the team (Kelly & Barsade, 2001). The experiences occur at the individual level are shared and spread among other team members. TEI

serves as affective composition of the team to represent their emotional awareness and management ability. Being emotionally intelligent involves being able to identify, understand, process, and influence one's own emotions and those of others to guide, thinking, and action (Mayer & Salovey, 1997). The complete picture of the team emotion is where affective composition summarizes the "bottom-up" and "top down" approach to the team emotion affect. Depending on the team interactions and emotion of a team, these behaviors can lead to varying team-level functioning and regulation (Kelly & Barsade, 2001). Because this is an exploratory study the direction or pattern of the relationship is not hypothesized. The hypotheses are to evaluate whether the relationships exist in the team emotion framework. The prior literature suggests that team implicit facial recognition and explicit affective tone will influence TEI.

H6: Team implicit facial recognition will influence TEI
H7: Team explicit affective tone will influence TEI

Method

Experimental Setting

A laboratory experiment was used to test the hypotheses. The nine (9) subject teams (3-members per team) participated in two 30-minute Logistics simulation games on an ERP system (Léger et al., 2007; Léger et al., 2006). The sample consisted of 27 (9 males and 18 females) students at a major university in Canada.[3] The average age of participants was 22.8 years old with a standard deviation of 6.6 years. The student majors included: none-IS (43%), IS (24%), Business Management (17%), Finance (7%), Supply Chain & Logistics (7%), and Accounting (2%).

[3] All subjects were undergraduate students from an AACSB accredited institution in Canada.

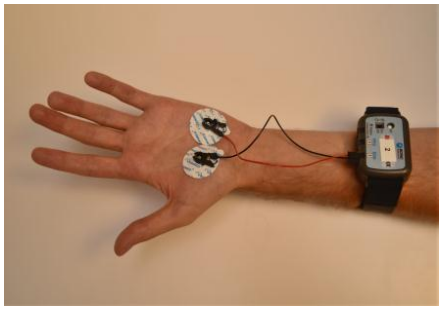
The experiment was approved by the Institutional Review Boards (IRB) of the institutions involved in the study. The IRB reviews research protocols and procedures to ensure the appropriateness of the study. Subjects were compensated with either a $30 -Visa or Amazon gift card for their participation in the experiment. The study was conducted over a three-week period. A pilot study was conducted during the first week to refine the experimental protocol and to validate the measures used in the study.

ERPSIM is comprised of several business simulation games developed by scholars at HEC Montreal (Léger et al., 2007) for students to learn ERP concepts on a real-world SAP enterprise system (Léger, 2006). Students execute real-world SAP transactions, access SAP reports, and perform tasks to simulate manufacturing, accounting, distribution, sales, and logistics functions to operate a fictional company for profit. Several ERP simulation (Léger et al., 2007) games exist. The Logistics simulation game was chosen because of two key aspects: a) the hands-on experience of an enterprise system where information is integrated across departments, and b) the experience of how the technology can trigger change (Léger et al., 2007). Each team consisted of three members who were assigned a functional role of: 1) Reports manager, 2) Price manager, and 3) Stock manager. The team role was the same in both simulation games. During the simulation game, team members had to make critical business decisions, and proactively manage the day-to-day operations of their logistics company while competing against other virtual logistics companies operating in the same market. Each logistics company buys, distribute, and market dairy products in order to satisfy customer demand and maximize profit. For the purpose of the study, the subjects were randomly assigned in teams (9 teams of 3 persons = 27 participants).

Before playing the simulation game, subjects confirmed voluntary participation by signing a consent form. Next, they were provided standardized instructions on the experimental procedure. With each participants' consent, pre-gel single use disposable electrodes were attached to the palms of each subjects' hands to measure EDA. The EDA measures were captured using the Biopac© MP150 system (Biopac Systems, Inc, Goleta, CA). Alternating, preparation was performed on each subject to attach the neurophysiological sensors for EDA while other subjects answered a pre-experiment survey (See Figure 2). The subjects completed viewing 3 videos: 1) an introduction to the logistics game (10 minutes), 2) an interactive training on ERP system navigation (10 minutes), and 3) a role-specific training (5-10 minutes). Microsoft HD 5000 webcam (Microsoft, Inc., Redmond, WA) devices were properly focused and adjusted to each subject for video recording by the facial recognition software, FaceReader (Noldus Information Technology, The Netherlands, 2013) during the simulation game (See Figure 2).

Figure 2 Positioning of experiment components (provided by Tech3Lab©)

Electrodermal Response



Webcam

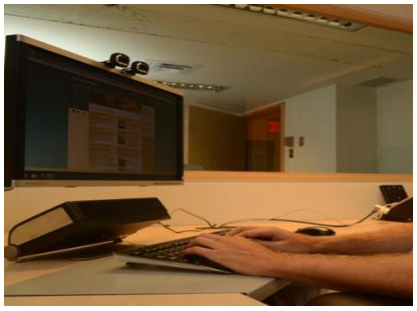


Figure 3 shows the configuration of the Tech3lab© layout and seating of each participant (middle table was used for this experiment) at their respective computer for this experiment. Each simulation game was randomly assigned to a hard or easy task difficulty level. At the end of the first simulation game, subjects were instructed to discuss for 5-10 minutes among themselves their strategy for the second simulation game and to complete a short (5-minute) on-line survey. At the end of the second simulation, subjects completed an on-line post-experiment survey and were debriefed.

Figure 3 HEC Lab layout (provided by Tech3Lab©)

In this study, FaceReader (Noldus Information Technology, The Netherlands, 2013) a technology used to analyze facial expression patterns from video data online and/or offline is used. This software reconstructs the face three-dimensionally, based on 491 model points, allowing a robust and reliable measurement of seven facial expression patterns, representing six basic emotion patterns: angry, happy, disgusted, sad, surprised, and neutral. These emotional categories are confirmed as described by Ekman (1970) as the basic or universal emotions. The facial expressions are tracked continuously, thus providing the ability to capture changes in real-time. Robustness and reliability have been tested in many different studies (Den Uyl & Van Kuilenburg, 2005; Terzis, Moridis, & Economides, 2010; Bijlstra & Dotsch, 2011; Gorbunov, 2012; Danner, Sidorkina, Joechl, & Duerrschmid, 2013). Specifically, using FaceReader, this research aimed to disentangle and identify how the effect of implicit facial expression patterns

influences on TEI to form team emotion. The FaceReader technology captured the emotional and socially relevant facial expressions as experienced by indivduals within their respective teams.

The use of FaceReader technology for team-level analysis is scarce (Gorbunov, 2013). However, Terzis, Moridis, & Economides (2010) found that FaceReader agrees with the judgments of trained observers in 89% of all cases. FaceReader technology is mainly used for research in the areas of psychology, education, market research, and consumer behavior. In a vast search of the literature, Gorbunov (2013) examined team behavior using FaceReader to develop a methodological toolbox for an automatic monitoring of psychosocial atmospheres during long-term missions performed by small crews in isolation. The focus of this research was to a) analyze the interpersonal interactions to derive insights about aspects of operation in interpersonal relations, and b) to measure and analyze emotional states of the crew members.

Operationalization of the Variables

Measuring team emotional variability under psychometric scale raises multiple challenges; psychological measures offer real time and objective reactions (Dimoka, Pavlou, & Davis, 2011; Léger, Riedl, & vom Brocke, 2014). This exploratory study combines both self-report and neurophysiological measures to evaluate the team-level emotions behaviors. No single gold-standard method exists for emotion measurement (Scherer, 2005). Ortiz de Guinea & Webster (2013, p.1166) put forth that emotion self-report measures "cannot capture automatic use states or patterns that occur outside individuals' awareness". The ideal emotion measure includes: a) capture of continuous changes in appraisal processes, b) response patterns, c)

motivational changes results, and d) patterns of facial and vocal expression, e) nature of the subjective experience reflecting all changes.

The EDA data were measured following the established methods in Léger, Riedl, & vom Brocke (2014) and measured using *Non-Specific Amplitude of Electrodermal Activity (AMP.NS.EDA):* Data were collected using a Biopiac© 150 system (Biopac Inc., Goleta, CA). A five-minute EDA, corresponding to each simulation game, was manually corrected for artifacts. For this research, following Boucsein (2012, p.181), the data were normalized and transformed in the sample for the percentage of the span from the signal within the experiment. For the normalization, the EDA was transformed in z scores, means, and standard deviations of the recorded EDAs for each particular individual. Then a standard value is calculated for each EDA amp. The z scores are normally distributed and commonly transform to a mean of 50 and a standard deviation of 10; therefore, minus signs drop out. The individual member data was aggregated to the team-level for analysis.

Facial recognition data were captured using the FaceReader technology (Noldus Information Technology, The Netherlands, 2013). The FaceReader has been trained to classify facial expressions in seven distinct categories: happy, sad, angry, surprised, scared, disgusted and neutral. The valence indicates whether the emotional state of the subject is positive or negative. Within the FaceReader technology, happy is the only positive emotion; sad, angry, scared, and disgusted are considered to be negative emotions. Surprised can be either positive or negative. Each emotion from the FaceReader software is expressed as a value between 0 and 1, indicating the intensity of the emotion. '0' means that the emotion is not visible in the facial expression, '1' means that the emotion is fully present. These intensity values have been validated by trained specialist. The facial expressions are often a mixture of emotions and it is possible that two or

more emotions occur simultaneously with a high intensity. The sum of the intensity values for the seven emotions at a particular point in time is normally not equal to 1 and the emotional state of the subject is estimated. The emotion state values estimated the emotional state of each subject based on the amplitude, duration, and continuity. The data values were aggregated to model previously published team level physiological measures (Caya et al., 2012). The data was aggregated at the end of each five-minute segment in order to observe a more meaningful relationship between facial recognition patterns and the resulting team emotion. The explicit affective tone was measured using a non-verbal pictorial assessment technique, Self-Assessment Manikin (SAM) that directly measures the *Valance* (happy to unhappy), *Arousal* (calm to excited), and *Dominance* (controlled to in-control) associated with an individual's affective reaction to a stimuli (Bradley & Lang, 1994). The SAM Manikin has been successfully used to measure emotional responses during team IS system use (Léger, Davis, Perret, & Dunaway, 2010) and other stimuli such as images (Miller, Levin, Lozak, Cook, et al., 1994), game experience (Poels, Hoogen, Ijsselsteijn, & de Kort, 2012), and sounds (Bradley, 1994). In this research study, subjects were asked to rate their feelings by clicking on a manikin that best represent their emotion. Each team answered the SAM survey in the post-experiment on-line survey.

The Table 1 describes each construct, its construct operationalization, and how the construct was measured.

Table 1
Summary of Constructs

Construct	Operationalization	Measurement
Cooperative Team norms	Team behavior formed through social influence to foster congruent and cooperative belief in team work	Aggregated self-report, adapted from Chatman & Flynn's (2001) cooperative norms scale
Task Difficulty Level	Variability level of the cognitive resources required to perform tasks in the simulation game	Random assigned static value for difficulty level (hard, easy)
Team Implicit Facial Recognition	Implicit emotion processing among team members where homogeneous facial expressions is subconsciously and automatic of nearby team members	Aggregated FaceReader emotional categories – happy, sad, anger, surprised, scared, disgusted neutral
Team Affective Tone	Explicit emotion processing occurs when high similarities of consistent or homogeneous affective reactions are experienced within a team (George, 1990; Collins et al., 2013)	Aggregated self-assessment Manikin, visual pictorial categories of arousal, dominance, and valence(Bradley & Lang, 1994)
Team Emotional Intelligence	Team arousal and valence exerted as an emotional regulation mechanism	Aggregated EDA-skin conductance (AMP.NS.EDA)

Results

Descriptive Statistics

Table 1 presents the descriptive statistics and correlation of the variables in this study. Descriptive statistics are based on a panel dataset of 108 valid observations (27 subjects, 1 game, 30 minutes). Insufficient physiological data were available for Game 2 of the experiment due to data recording errors. FaceReader measures of disgusted, happy, and scared were dropped from the model due to a lack of normally distributed data values. Physiological data for FaceReader

and EDA were extracted at 4 points in time at 5-minute interval periods for 1 round of simulation data.

Table 2

Descriptive Statistics and Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. EDA_zScore													
2. Team_Norm	-.48												
3. TAFT_Arousal	-.53	.60											
4. TAFT_Dom	-.16	.04	-.20										
5. TAFT_Valence	-.56	.54	.42	.24									
6. FR_Neutral	.48	-.28	-.44	-.04	.01								
7. FR_Sad	.14	-.27	-.19	-.02	-.24	.20							
8. FR_Angry	.08	-.13	-.03	.29	-.54	-.49	.05						
9. FR_Surprised	.23	-.20	-.29	.19	-.34	-.15	-.23	.13					
10. FR_Valence	-.51	.62	.49	-.07	.52	-.40	-.72	-.25	-.10				
11. Team_PriorEXP	-.10	-.21	-.15	.74	.45	.34	.17	-.17	-.16	-.19			
12. Team_Fam	.02	.27	-.20	.30	.30	.23	-.31	-.10	.11	.05	.16		
13. Task_Difficulty	.46	-.70	-.74	-.07	-.24	.60	.30	-.38	.13	-.41	.28	-.26	
Mean	.51	5.21	2.44	2.96	3.66	.80	.06	.01	.08	.01	.97	2.08	.56
SD	.15	.57	.48	.49	.32	.06	.03	.01	.06	.05	.71	.96	.51

** Correlation is significant at the 0.01 level (2-tailed) >= .43.

* Correlation is significant at the 0.05 level (2-tailed) >= .34.

Hypothesis Testing

A repeated measures data set with 108 valid observations were used to estimate Model 1 (dependent variable: team implicit facial recognition- Neutral, Anger, Surprised, and Sad; team affective tone-arousal, dominance, and valence) For data analysis, STATA/SE 10.1 was used with XTreg command for the estimation (XTreg is used with longitudinal or panel data; it fit cross-sectional time-series or panel data regression models with random-effects; further information on this procedure can be found in StataCorp, pp.1691.

Prior research advocates the use of the intraclass correlation (ICC), an index of the degree of similarity (dissimilarity) which measures the extent to which scores within the same group are more similar to one another than scores from different groups (Bliese, 2000; Klein &

Kozlowski, 2000). This assessment of agreement has primarily been argued as a pre-requisite such that a higher level construct can be operationalized. Klein & Kozlowski (2000) suggest "when macro researchers attempt to generalize findings from aggregated data back to the lower level at which it was collected, they commit the well-known ecological fallacy"(p.213). Furthermore, the contributions of team member inputs to processes, states, and performance are less substitutable and redundant such that higher level team constructs cannot be understood through simple linear aggregations (Murase, Doty, Wax, DeChurch, & Contractor, 2012). The statistical approach for this study utilizes robust standard errors to allow for intragroup correlation, relaxing the usual requirement that the observations be independent (STATA Corp, 2012). That is, the observations are independent across clusters (teams) but not necessarily within groups. This approach supports a compilation method where measures collected from lower-level entities combine in nonlinear, complex ways to generate a whole not just an aggregation of its constituent parts (i.e. Mathieu & Chen, 2011).

This study was exploratory and the results provide a granular explanation of team implicit and explicit emotions for the relationships examined. It is to be noted FaceReader results for valence are included for informational purpose and exploratory examination. Consistent with prior literature, valence is not a facial expression, but the degree or intensity to which the emotional state is positive or negative (Noldus Information Technology, The Netherlands, 2013; Russell, 1980).

The results do not support the main effects for H1a (Reference Table 3). Team norms influences on implicit emotions were not significant: Sad (β= .00, $p < .26$); Angry (β= .00, $p < .56$); Surprised (β =.-01, $p < .83$); Neutral (β = -.02, $p < .20$). Team norms influences on explicit, team affective tone were significant for: valence (β = .04, $p < .03$) and arousal (β = .28, $p < .04$).

H1b was partially supported (Reference Table 4). The results were strong and positive. Task difficulty influence on implicit facial recognition was significant for: Neutral ($\beta = .07$, $p < .01$). Other measures of task difficulty influence on implicit facial recognition were not significant for: Sad ($\beta = .02$, $p < .26$); Angry ($\beta = .00$, $p < .30$); Surprised ($\beta = .01$, $p < .67$). H2a was partially supported (Reference Table 3). Task difficulty influence on explicit, team affective tone measure, dominance was not significant ($\beta = -.70$, $p < .86$). Strong support was found for task difficulty influence on explicit team affective tone measures: valence ($\beta = -.70$, $p < .02$) and arousal ($\beta = .09$, $p < .00$). Task difficulty was negatively associated with valence and positively associated with arousal. Thus, H2b was partially supported (Reference Table 4). Overall, the main effects for task difficulty on neutral, implicit facial recognition, was more salient.

Table 3

Model Main Effects for Implicit Facial Recognition

	Model 1 Dependent Variable: Sad				Model 2 Dependent Variable: Angry				Model 3 Dependent Variable: Surprised				Model 4 Dependent Variable: Neutral				**Model 5 Dependent Variable: Valence			
	Coef.	Std. Err.	P > t	t	Coef.	Std. Err.	P > t	t	Coef.	Std. Err.	P > t	t	Coef.	Std. Err.	P > t	t	Coef.	Std. Err.	P > t	t
Team Norms	.00	.00	.26	-1.23	.00	.00	.56	-.58	-.01	.02	-.83	.43	-.02	.02	.20	-1.40	.03	.02	.12	1.79
Task Difficulty	.02	.01	.30	1.11	.00	.00	.30	-1.04	.01	.04	.67	.43	.07	.24	.01	3.00	.00	.04	.91	.11
	R^2= .10				R^2= .43				R^2= .04				R^2= .38				R^2= .39			

** reported for informational purpose and exploratory examination

Table 4

Model Main Effects for Team Affective Tone

	Model 1 Dependent Variable: Valence				Model 2 Dependent Variable: Dominance				Model 3 Dependent Variable: Arousal			
	Coef.	Std. Err.	P > t	t	Coef.	Std. Err.	P > t	t	Coef.	Std. Err.	P > t	t
Team Norms	.04	.02	.03	2.22	.01	.02	.88	.15	.28	.12	.04	2.40
Task Difficulty	-.70	.24	.02	-2.94	-.07	.37	.86	-.02	.09	.03	.00	2.93
	R^2= .39				R^2= .00				R^2= .56			

H3 predicted that task difficulty would positively influence TEI. The main effects results show implicit emotion dimensions: Sad ($\beta = .13$, $p < .10$); Angry ($\beta = .07$, $p < .03$), Surprised ($\beta = .19$, $p < .03$) and Neutral ($\beta = .10$, $p < .05$), significantly influence TEI as measured by EDA. These results indicate that team facial recognition is dependent on the level of the task difficulty and suggest the emotions are similar whether implicit or explicit. The explicit emotion dimensions: dominance ($\beta = .17$, $p < .01$) and valence ($\beta = -.09$, $p < .00$) significantly influence TEI as measured by EDA: arousal ($\beta = .06$, $p < .40$) was n.s. Results are shown in Tables 5 and 6.

Next, interaction effects were evaluated. Two separate models were run to test the support for the main effects and the moderated interaction affects the implicit and explicit emotion mechanisms. Table 6 reports the results of predicting team facial recognition mechanisms moderates the relationship between task difficulty and TEI. Table 5 reports the results of predicting team affective tone mechanisms moderates the relationship between task difficulty and TEI. Cohen's f-square was computed to check the effect size of each main-effect variables and the interaction terms. By convention, f-square effect sizes of .02, .15, and .35 are termed small, medium, and large respectively (Cohen, 1988). All of the significant variables had effect sizes that were large.

Table 5

Model Effects for Team Affective Tone

	Model 1 - Valence Dependent Variable TEI (EDA_Z) Direct Effects				Model 2 - Valence Dependent Variable TEI (EDA_Z) With Interactions			
	Coef.	Std. Err	P > z	z	Coef.	Std. Err	P > z	z
Task Difficulty	.13	.05	.00	2.64				
Valence	-.09	.03	.00	-3.63				
Valence x Task Difficulty					.04	.05	.45	.76
R^2	.42			.00	.43			.00
Effect size	.70							
	Model 1 - Dominance Dependent Variable: TEI (EDA_Z) Direct Effects				Model 2 - Dominance Dependent Variable: TEI (EDA_Z) With Interactions			
	Coef.	Std. Err	P > z	z	Coef.	Std. Err	P > z	z
Task Difficulty	.17	.07	.01	2.47				
Dominance	-.02	.03	.46	-.74				
Dominance x Task Difficulty					.00	.08	.91	-.10
R^2	.23			.01	.23			.04
Effect size	.30							
	Model 1 - Arousal Dependent Variable: TEI (EDA_Z) Direct Effects				Model 2 - Arousal Dependent Variable: TEI (EDA_Z) With Intereactions			
	Coef.	Std. Err	P > z	z	Coef.	Std. Err	P > z	z
Task Difficulty	.06	.08	.40	.84				
Arousal	-.14	.05	.00	-2.78				
Arousal x Task Difficulty					.14	.08	.08	1.75
R^2	.29			.00	.34			.00
Effect size	.40				.51			

Table 6

Model Effects for Implicit Facial Recognition

	Model 1 - Sad Dependent Variable: TEI (EDA_Z) Direct Effects				Model 2 - Sad Dependent Variable: TEI (EDA_Z) With Interactions			
	Coef.	Std. Err	P > z	z	Coef.	Std. Err	P > z	z
Task Difficulty	.16	.06	.01	2.59				
Sad	.13	.08	.10	1.67				
Sad x Task Difficulty					-.16	.09	.07	-1.83
R^2	.33			.00	.36			.00
Effect size	.49				.53			
	Model 1 - Angry Dependent Variable: TEI (EDA_Z) Direct Effects				Model 2 - Angry Dependent Variable: TEI (EDA_Z) With Interactions			
	Coef.	Std. Err	P > z	z	Coef.	Std. Err	P > z	z
Task Difficulty	.25	.06	.00	4.22				
Angry	.07	.03	.03	2.20				
Angry x Task Difficulty					-.03	.07	.61	-.51
R^2	.37			.00	.37			.00
Effect size	.59							

Model 1 - Neutral Dependent Variable: TEI (EDA_Z) Direct Effects					Model 2 - Neutral Dependent Variable: TEI (EDA_Z) With Interactions			
	Coef.	Std. Err	P > z	z	Coef.	Std. Err	P > z	z
Task Difficulty	.11	.08	.17	1.38				
Neutral	.10	.06	.05	1.96				
Neutral x Task Difficulty					-.08	.07	.25	-1.14
R^2	.33			.00	.33			.00
Effect size	.49							
Model 1 - Valence Dependent Variable: TEI (EDA_Z)					**Model 2 - Valence Dependent Variable: TEI (EDA_Z)			
	Coef.	Std. Err	P > z	z	Coef.	Std. Err	P > z	z
Task Difficulty	.14	.06	.01	2.49				
Valence	-.07	.03	.02	-2.41				
Valence x Task Difficulty					.18	.06	.00	3.17
R^2	.38			.00	.53			.00
Effect size	.53							
** reported for informational and exploratory examination								

H4 predicted that facial recognition mechanisms would moderate the relationship between task difficulty and TEI. Interaction effects results were strong for the implicit emotions: sad (β=.13, $p < .10$, R^2= .36) and surprised (β=.06, $p < .40$, R^2=.36) were significant. The implicit emotion interaction effects for sad and surprised increased the explained variance by 9% in their respective models. Interaction effects for neutral and angry implicit emotions were n.s. H4 was partially supported. The interaction effect for explicit team emotion valence (β=.14, $p < .08$) was significant and negative. Arousal and dominance explicit emotions were n.s, thus H5 was not fully supported.

H6 and H7 predicted the effects of both implicit and explicit team emotion mechanisms would influence their emotion regulation (TEI) as measured by EDA. Implicit emotion mechanisms influenced TEI. To test these hypotheses, a regression analysis was performed. Implicit emotion mechanisms were regressed on TEI as measured by EDA. Implicit emotions:

neutral (β=.13, p < .00), angry (β=.07, p < .01), surprised (β=.06, p < .02) were significant; sad (β=.00, p < .71), was n.s. This model explains 47% of the variance in TEI. Thus, strong support is revealed to show implicit facial recognition influences TEI. Thus, H6 is fully supported. Implicit emotion mechanisms influenced TEI. Another regression analysis was performed. Explicit emotion mechanisms were regressed on TEI as measured by EDA. Explicit emotions: valance (β= -.05, p < .04), dominance (β= -.05, p < .71), and arousal (β= -.08, p < .00) were significant. Arousal was the strongest influence on TEI. Thus, H7 was fully supported. Strong support was revealed to show explicit emotion mechanisms influences TEI. Thus, H6 is fully supported. This model explains 44% of the variance in TEI. Table 7 summarizes the results for H6 and H7.

Table 7

Model Effects for Team Emotional Intelligence

	Dependent variable: TEI (EDA_zScore)								
	Implicit Emotion Facial Emotion Recognition					Explicit Emotion Team Affective Tone			
	Coef.	Std. Err	P > z	z		Coef.	Std. Err	P > z	z
Sad	.00	.02	.71	.37	Arousal	-.08	.02	.00	-3.04
Angry	.07	.03	.01	2.58	Valence	-.05	.03	.07	-2.10
Surprised	.06	.03	.03	2.21	Dominance	-.05	.03	.07	-1.80
Neutral	.14	.03	.00	4.65					
R^2	.45			.00	R^2	.44			.00

Discussion

This lab study aimed to uncover the emergent nature of affective linkages in team emotion, to examine how implicit and explicit mechanisms of team emotion explain causality of teams' emotional intelligence, and how well neurophysiological tools measure team implicit and explicit processes. The results were examined at a granular level to understand the specific emotion dimensions and the constructs of interest. This granular analysis is important in an

exploratory study enabling a more in depth discovery of the phenomenon behaviors. Table 8 summarizes the findings of the study according to the different implicit and explicit emotional states.

Table 8

Summary of Findings

Findings

	Implicit Team Facial Recognition				Explicit Team Affective Tone		
Hypothesis	Neutral	Sad	Angry	Surprised	Arousal	Dominance	Valence
H1a: Team norms will positively influence team implicit emotion	Not supported	Not supported	Not supported	Not supported			
H1b: Team norms will positively influence team explicit emotion					Supported	Not Supported	Supported
H2a: Task difficulty level will positively influence team implicit emotion	Supported	Not supported	Not supported	Not supported			
H2b: Task difficulty level will positively influence team explicit emotion					Supported	Not Supported	Supported
H3: Task difficulty level will positively influence TEI	Supported	Supported	Supported	Supported	Not supported	Supported	Supported
H4: Team emotional contagion mechanisms moderates the relationship between task difficulty and TEI	Not supported	Supported	Not supported	Not supported			
H5: Team affective tone mechanisms moderates the relationship between task difficulty level and TEI					Supported	Not Supported	Not Supported
H6 Team implicit emotion processing will influence TEI	Supported	Not supported	Supported	Supported			
H7: Team explicit emotion processing will influence TEI					Supported	Supported	Supported

Results show team norms (self-reported) have a more salient impact on the teams' explicit affective tone than the teams' facial recognition mechanisms. None of the dimensions of implicit facial recognition was influenced by the team norms. It appears the teams' facial recognition awareness is less emotion-aware at the team level. Though, earlier studies emphasized facial expressions are universally expressed and recognized by humans; these results suggest that at a team-level, facial recognition processes are not as apparent at the team-level.

Team affective tone as measured by the SAM manikin results best described the homogeneous affective reactions within the team. The norms positively influence the collective valance relates to a happy or pleased behavior of the team. The norms also positively influenced arousal. Positive and high arousal indicates an active rather than passive engagement in response to stimuli. This type behavior would be expected in the IT Team given the complex, experiential, fast-pace nature of the ERP task work embedded into the simulation game.

The task difficulty level as experienced by the teams show more influence on explicit emotion mechanisms than explicit emotion mechanisms. The level of the task work performed in the simulation shows that the cognitive effort to perform the tasks is important for implicit neutral emotion, and explicit valance and arousal. In particular, the task difficulty impact on arousal was negative implying a sad or gloomy team behavior. These emotions may be attributed to the nature of the lab study and the expectations of the experiment participation. However, the teams' explicit arousal results show positive active engagement. Difficult perceptions have been shown to motivate individuals not necessarily by the task success or failure, but rather by whether the task has a serious sense of challenge (Malone & Lepper, 1987). Overall, strong support was found for task difficulty to influence not only the implicit and explicit mechanism but also most importantly, the teams' emotional intelligence. These results

corroborate with a prior neural study where performance of a task, using fMRi technology, shows that EI is related to reasoning about social situations, specifically social exchange reasoning during information processing (Reis, Brackett, Shamosh, Kiehl & et al., 2007).

The significance of the moderated effects (H4 & H5) in the model suggests negative and active team behaviors facilitate the implicit and explicit mechanisms that can influence the teams' emotional intelligence. The arousal is positive; suggesting higher arousal can change the relationship between the task difficulty level and the TEI. On the other hand, implicit team behavior of sad, a negative behavior, suggests the more negative the team behavior the greater the relationship changes between the difficulty of the task and TEI. In other words, negative team behaviors may have less positive behavior on the teams' ability to apply emotion regulation (e.g. awareness and management) while performing IT task work.

This study contributes to the NeuroIS literature in several ways. The exploratory findings suggest that combined physiological and psychometric measures of team emotion behavior provide explanatory power for affective causal linkages in teams during IS technology use. Also, this study contributes to understanding how the non-verbal of emotion as observed in the FaceReader technology can play a role to interpret the felt collective emotion of the team. This exploratory study helps to provide evidence of homogeneous facial emotional states that can perhaps benefit team cognition and performance outcomes. The physiological measures offer deeper insights into behaviors while IT team members are engaged in technology use real-time.

Future research into the patterns of IT usage behaviors associated with emotion behaviors occurring overtime may reveal specific opportunities for TEI training and IS system design. A longitudinal study can provide insights that may reveal IT team behaviors that otherwise may be overlooked. This study also lends a foundation to IT team formation where their emotional

behaviors can be captured and assessed to determine team viability, team cohesiveness, and team member compatibility. IT team training can benefit from these results to evaluate team emotion well-being and team functioning for productivity gains. Lawler (1992) posits that emotion is the essential social process in group (i.e. team) formation and maintenance, because positive emotions strengthen feel of control. Furthermore, George & Brief (1992) have argued that positive feelings are an essential prerequisite for group (i.e. team) effectiveness, satisfaction, and commitment.

This research theorized both neurophysiological and psychometric measures to understand a more complete picture of the team behavior. Though exploratory, this study offers an awareness that IT managers and their teams can utilize to start a conversation about how subconscious team behaviors and their well-being may benefit team interactions when technology systems are engaged. Future studies of specific IS transaction use and IS business processes execution can be examined with regards to team emotion regulation for better IS design and team communication for performance improvements.

Finally, the combination of implicit and explicit mechanisms to explain causal effect linkages in IT Teams through the observed enterprise technology proved to be rich and effective to understand team emotion behaviors. The results show that the teams behaviors measured with physiological tools and self-report have significant predictive value to understand team emotion behaviors. This study contributes not only to the NeuroIS research, but also advances IT Teams research. To the best of my knowledge, this is the first study that evaluated emotion facial recognition and EDA measures combined with psychometric emotion self-report measures to evaluate team level behaviors. These results show that at granular level of analysis different emotion states for team's research that can be included in future IS studies.

This exploratory study has several limitations, which offer potential for future studies. A small sample of teams was used to evaluate the hypothesized relationships, increasing the numbers of teams may provide more significant relationships and serve to replicate findings. Though statistically significant results were found based on a small sample (which is not uncommon in studies with physiological measurement), a larger sample of teams may strengthen the results beyond the findings in this exploratory study (Leger, Riedl, & vom Brock, 2014). Moreover, heart rate variability, another physiological measure, could be used to complement the team emotion behavior with the teams' stress level (i.e., Riedl, 2013) to examine further the emotional state of the team and impact to TEI. Also, testing in a natural setting with corporate teams may show different results for generalizability.

By investigating how the explicit and implicit team behaviors mediate team processes on team outcomes could possibly offer practical implications that could be used in IT team training, norming, and functioning. The findings demonstrate a comprehensive approach to team emotion behavior and the aspect of TEI. This type of research can be methodologically challenging and limitations exist, specifically the team-level aggregation approach for data analysis. The temporal aggregration of the physiological measures may mask or obscure some of the dynamics in the microexpressions that occur at a much finer temporal resolution. Thus, further investigation of the granular temporal data is a direction for future research. In addition, more research is warranted to understand the strengths and weaknesses of this type of behavior modeling for team analysis to understand this phenomenon.

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Appendix

Research Compliance

December 16, 2013

MEMORANDUM

TO:	Mary M. Dunaway Pierre-Majorique Leger Fred D. Davis Paul Cronan
FROM:	Ro Windwalker IRB Coordinator
RE:	New Protocol Approval
IRB Protocol #:	13-11-293
Protocol Title:	*An Examination of Team Behavior in the Context of ERP Technology*
Review Type:	☐ EXEMPT ☒ EXPEDITED ☐ FULL IRB
Approved Project Period:	Start Date: 12/16/2013 Expiration Date: 12/11/2014

Your protocol has been approved by the IRB. Protocols are approved for a maximum period of one year. If you wish to continue the project past the approved project period (see above), you must submit a request, using the form *Continuing Review for IRB Approved Projects*, prior to the expiration date. This form is available from the IRB Coordinator or on the Research Compliance website (http://vpred.uark.edu/210.php). As a courtesy, you will be sent a reminder two months in advance of that date. However, failure to receive a reminder does not negate your obligation to make the request in sufficient time for review and approval. Federal regulations prohibit retroactive approval of continuation. Failure to receive approval to continue the project prior to the expiration date will result in Termination of the protocol approval. The IRB Coordinator can give you guidance on submission times.

This protocol has been approved for 100 participants. If you wish to make *any* modifications in the approved protocol, including enrolling more than this number, you must seek approval *prior to* implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

If you have questions or need any assistance from the IRB, please contact me at 210 Administration Building, 5-2208, or irb@uark.edu.

V. Conclusion

This dissertation had three main objectives: (1) to evaluate team-level emotional intelligence (EI) measures that may benefit IS research and seek opportunities to extend overlooked aspects of these measures, (2) to empirically examine specific boundary conditions which can influence EI and the performance outcomes in IS teams, and 3) to explore a deeper understanding of teams' emotion and their emotional intelligence through the use of physiological tools to measure their behavior. To achieve the first objective, in Essay one I examined the emotional intelligence (EI) literature, summarized the relevant findings, and theorized the assessments that were used in empirical studies at the team level. Identified in Essay one were collaborative team norms and the use of physiological measures to capture team behavior. These aspects were added to the nomological net. Collaborative team norms were added to Essay two and physiological measures was introduced in Essay three. In Essay three, the TEI measures were evaluated in a lab experiment to examine the conscious and subconscious emotion and emotional intelligence behaviors. Physiological tools were combined with psychometric measures to measure the team behavior and to provide a more complete picture of causal affective linkages occurring in IS teams.

In the first essay, three theories were identified as the foundation for existing TEI measures – theories advanced by Salovey & Mayer (1990, 1997), Druskat and Wolff (2001), and Schutte et al. (1998). The Mayer & Salovey (1990; 1997) model of EI was discovered to be the most common theoretical basis to model EI. Their model of EI reflects behavior in the real world which is purposeful and directed toward team goals. Most salient are its characteristics that emphasize (a) perception, (b), assimilation, (c) understanding, and (d) management of emotions as a four-dimensional construct.

Druskat & Wolff's (2001) conceptualization is similar to the idea of "collective cognition" where the team is able to manage the awareness of one's own and others' emotions. This emotional awareness and management can assist individuals within the team in problem solving and decision making (Salovey & Mayer, 1990). Their theoretical views propose awareness and management of emotion in groups to improve group effectiveness by enabling a group to take advantage of the positive and negative emotions experienced by members. The emphasis is placed on emergent collective emotion norms that build social capital and support group effectiveness. These views suggest establishing specific team norms create awareness and regulation of emotion that can lead to better team outcomes. The emotional intelligent norms form when the attitudes and behaviors become habit within the team. Subsequently, a team-level emotional competence can emerge to benefit intra-team and cross-team boundaries within the organization. And finally, Schutte et al. (1998) theoretical underpinnings are based primarily on the original model of EI proposed by Salovey & Mayer (1990). The Schutte et al. (1998) EI model is comprised of four factors: optimism/mood regulation, appraisal of emotions, utilization of emotions, and social skills. Many researchers best characterize their EI evaluation as a type of personality inventory and not measures of EI (Hedlund & Sternberg, 2000; Mayer et al., 2000).

Five instruments were found that have assessed TEI and are grounded in the various theoretical bases. The five validated instruments that were examined that measure team emotional intelligence are: 1) Workgroup Emotional Intelligence Profile (WEIP), 2) Emotionally Competent Group Norm (ECGN) Inventory, 3) Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT), 4) Schutte Emotional Intelligence Scale (SEIS), and 5) Wong and Law Emotional Intelligence Survey (WLEIS). Of these five TEI assessments, all psychometric measures appear to sufficiently measure TEI. The WEIP-S showed significant empirical evidence to evaluate TEI

where the item scales address emotional intelligence specifically from a team perspective. The WEIP-S assessment offers a short 16-item assessment, which comprises 4 items for each of the four emotional abilities. Its use has practical application, provides an easy to use self-report measure that evaluates workplace-based emotion intelligence. The WEIP-S assessment was employed in Essay two to evaluate IS teams in a corporate IT environment. This assessment is structured to address EI as a directed EI team measure.

Two key observations were found in Essay one. First, neurophysiological tools present opportunity for greater accuracy in TEI measurement that can provide deeper insights into understanding the team emotion behaviors. Second, collaborative team norms serve as a key antecedent for TEI behaviors to help explain the apparent relationship between TEI and performance behaviors. Collaborative team norms were included as an antecedent construct in model for Essay two.

In the second essay, I examined how and when TEI mediates the effect of cooperative norms on performance as a function of the underlying levels of intra-team conflict and team expertise coordination. Specifically, the study addresses the extent to which team members, as whole, behaviorally express emotional management ability under varying conditions. The components in this study (simple mediation and moderation) have been tested before, but were combined in a model of moderated mediation. The context for this study was corporate IT teams that utilize enterprise technology in their task work. As a benefit to IT researchers, Weber (2003) suggests for richer theory development, researchers should take into consideration that they need to generate insights about the phenomena associated with IT in the organizational structure. Thus, value can be gained in understanding how context-specific IS situations and constraints affect having meaning in team behavior (i.e., John, 2006). It was argued that levels of intra-team conflict

and expertise coordination function as boundary conditions on the mediating effect of TEI on team cooperative norms and performance.

The results from Essay two have two key contributions for IS literature. First, TEI is a viable skill that enhances performance in IT teams. Second, in technology-environments, the teams' coordination can vary on levels of the expertise needed. Overall, TEI skills benefit the IT team as a whole. The characteristics of TEI, awareness and management of one's and others' emotions are important to the well-being of team performance. Recognizing these specific team behaviors and how they differ with emotion management abilities is a critical step toward increasing team performance and understanding the social cognitive skills that are essential in knowledge-intensive IT team work.

This research is one of the few to empirically examine the effects of cooperative team norms, TEI, team performance, intra-team conflict, and expertise coordination at the team-level. Although, evidence did not support moderated mediation for intra-team conflict and coordination factors: expertise location and expertise brought to bear, this study contributes to understanding team behaviors that are relevant for emotion management and awareness within IT teams. The team cooperative norms and TEI are key behaviors that organizations should emphasize for team effectiveness and efficiency.

Essay three was an exploratory lab study experiment that examined: 1) affective linkages in team emotion 2) implicit and explicit mechanisms of team emotion to explain causality of teams' emotional intelligence, and 3) how well do neurophysiological tools measure team implicit and explicit processes. The focus of the study was an attempt to explain the emergent implicit and explicit affective linkages in team emotions. The experimental design captures a richer explanation of these relationships; neurophysiological and self-report measures are captured simultaneously to

examine the implicit and explicit shared emotion processes, and TEI. I introduced electro dermal activity (EDA) and facial recognition technology to capture implicit emotion team behaviors. The implicit and explicit team processes were combined to offer greater understanding of team emotion linkages real-time.

Results show that team norms have a more salient impact on the teams' explicit affective tone than the teams' emotional contagion mechanisms whereas none of the dimensions of implicit emotional contagion was influenced by the team norms. It appears the teams' facial recognition awareness is less emotion-aware at the team level. Though, earlier studies emphasized that facial expressions are universally expressed and recognized by humans; these results suggest that at a team level, emotional contagion processes are not as apparent at the team-level.

Team affective tone as measured by the SAM manikin results best described the homogeneous affective reactions within the team. The team norms positively influence *valence* which relates to the happy or pleased team behavior. The norms also positively influenced *arousal*. Positive and high *arousal* indicates an active rather than passive engagement in response to stimuli. This type behavior would be expected in the IS team given the complex, experiential, fast-pace nature of the ERP task work embedded into the simulation game.

The task difficulty level plays a role in how emotions are experienced in a team setting. The level of the task work performed in the simulation showed that the cognitive effort to perform the tasks is important for implicit neutral emotion and explicit *valence* and *arousal*. In particular, the task difficulty impact on *arousal* was negative implying a sad or gloomy team behavior. Overall, strong support was found for task difficulty to influence not only the implicit and explicit mechanism but also, most importantly, the teams' emotional intelligence.

The significance of the moderated effect in the model suggests negative and active team behaviors facilitate the implicit and explicit mechanisms that can influence the teams' emotional intelligence. Finally, the combination of implicit and explicit mechanisms to explain causal effect linkages in IS teams through the observed enterprise technology proved to be rich and effective to understand team emotion behaviors. The results show that the teams behaviors measured with physiological tools and self-report have significant predictive value to understand team emotion behaviors. This study informs the NeuroIS focus research about IS team behaviors. The results show, at granular levels of analysis different emotional states for team research that can be included in future IS studies. Though this study has limitations regarding a small sample size, the results are rich and can be applied in future IS studies.

This dissertation makes three key contributions. First, it introduces EI as a strategic benefit for IT teams that can impact their performance and improve interactions. It has been increasingly acknowledged in the IS literature the important role that contextual factors beyond the individual can play in affect (emotion) technology-related behavior. This research addresses the gap in IS research to incorporate emotion influences at levels beyond the individual user that shape how teams use IS in their jobs. These studies help to fill this gap. Enterprise technology use and the teams that perform this of type task work are global and widely used in the majority of firms today.

Second, this research contributes to the NeuroIS literature. As a relatively new and emergent domain of research, this dissertation advances the use of neurophysiological tools to measure emotion behavior in IS teams. This study informs the IS literature about team behaviors that are useful in future studies. The granular analysis of the emotion helps to conceptualize the team behavior in a more depth and comprehensive manner. This research goes beyond what is traditionally performed in IS studies that utilize psychometric measures to uncover the neural bases

of cognitive, emotional, and social processes occurring simultaneously in IS teams. The FaceReader and EDA physiological tools provided data capture of the hidden processes that otherwise would be difficult to obtain for a deeper understanding about this phenomenon.

Third, this research contributes to the IS and teams literature. The constructs evaluated are relevant and give valuable explanations to important questions (Barki et al. 2007). Much of the work about teams has been on conscious feelings and expressions, in particular, the affect (emotion) that we are aware of and to which we trace to their source. Strategic use of emotions in teams can benefit the overall functioning of their interactions and is important part of emotional intelligence (Edmondson, 2013; Barsade & Gibson, 2007). Affect (emotion) in organizations is an element of influence in organizational team outcomes, thus team emotion is an essential piece in understanding team task work interactions and how to improve team interactions.

This research has several practical implications, such as training of employees, team member selection, and team viability. The top-down (contextual) and bottom-up (emergent) influences are complementary within teams. The interaction that happens within a team creates team phenomena and structures that serve to shape and constrain how the team regulates their emotion. The technology, can shape team member interactions (e.g., communication and coordination), which in turn underlie the emergence of team behaviors that may influence future patterns of technology use in the team. TEI for this study is an ability-based skill. The value of the EI ability-based model is that the skills can be acquired through training. Firms can tailor and develop team-based training for IS task work to encompass TEI to facilitate improving team performance and outcomes. This research is especially important, because the behaviors observed are in context-specific enterprise technology.

Though this type of research can be methodologically challenging, it offers a necessary and more complete view of the functioning and outcomes of team-level emotion. Future research of TEI would take on longitudinal studies, link team emotion behaviors to different type of enterprise technology use tasks and situations, and more teams for analysis. The IS field will benefit from further theoretical and empirical efforts on TEI, enterprise task work, and team outcomes for performance gains.

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