# Group social capital in virtual teaming contexts: A moderating role of positive affective tone in knowledge sharing

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## ABSTRACT

This study examines the interplay of social capital and positive affective tone in virtual group working contexts. This study integrates social capital theory with positive affective tone to postulate an integrated model that captures the main effects of social capital and the moderating effects of positive affective tone in the formation of knowledge sharing. Our empirical analysis confirms the duality between social and affective considerations in influencing knowledge sharing, as well as demonstrates a complex pattern of interdependencies between these two effects. The empirical tests show that knowledge sharing is positively influenced by positive affective tone, trust, and shared vision. Meanwhile, the effects of trust and social interaction on knowledge sharing are moderated by positive affective tone. Last, theoretical and managerial implications of our findings are discussed.

## 1. Introduction

A critical type of organizational work that has captured the attention of social and organizational researchers is knowledge work — one that involves creating, sharing, processing, and utilizing knowledge artifacts such as ideas, models, and decisions (e.g., [1,2]). Knowledge is widely considered a valuable organizational resource that is central to sustaining and improving an organization's product or service offerings, customer base, market share, innovation and competitive position in the industry. Unlike other organizational resources, knowledge typically resides in the minds of workgroup members and is only invoked during use. Such knowledge, when shared (i.e., knowledge sharing), can create organizational value by reducing the needs of information search and processing among collaborating workers, thereby making them more efficient and effective in achieving their job goals.

As knowledge sharing enables the sharing of relevant experiences and information between workgroup members [3], it is therefore important for workgroups to improve knowledge sharing so as to ultimately achieve their goals. The competitive position and effectiveness of workgroups are likely undermined in case of the lack of knowledge sharing [4]. Previous studies have related knowledge sharing to a variety of variables such as organizational transient, culture, situation-specific attitudes and incentives (e.g., [5]). However, none of prior research has linked knowledge sharing to group emotional state characterized by positive affective tone (i.e., group affective tone). Our goal is to understand how people in virtual teams with specific affective tone are willing to share their knowledge with online others.

A key driver of knowledge sharing in workgroups is social capital referring to as the features of social organizations that facilitate coordination and cooperation among workgroup members [6]. Over the last decade or so, the concept of social capital has captured the attention of sociologists (e.g., [6,7]) and organizational theorists (e.g., [8]) as a way of understanding why people in social communities, workgroups, and organizations share knowledge, ideas, and support with each other, even when

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there is no legal obligation or expectations of personal gains from doing so. Though organizational scholars have assessed the relationship between social capital and knowledge sharing, to the best of our knowledge, little prior research has critically examined the role of social capital in virtual groups by contrasting it with non-socially derived constructs, such as positive affective tone, that can also influence knowledge sharing. Without a thorough examination of positive affective tone and its joint effect with social capital on knowledge sharing in virtual workgroups, our understanding about knowledge sharing in virtual contexts will remain limited, and organizational initiatives directed at building social capital and improving affective tone will remain unjustifiable based on blind faith. In light of the above gaps in the literature, a key research question we examine in this study is "what role does social capital play in influencing knowledge sharing relative to positive affective tone among online workgroups?"

The rest of the paper proceeds as follows. The next section examines relevant theories and postulates hypotheses for empirical testing. The third section describes our research methods, including subjects, sampling, and construct operationalization. The fourth section describes our data analytic techniques and observed results. The final section presents a discussion of our findings, including its limitations and implications for research and practice.

## 2. Theory and hypotheses

### 2.1. Social capital theory

Social capital is defined as the "the features of social organizations such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit" ([6], p.67). Based on relationships between people in a social network, social capital is the invisible glue that holds social networks together and motivates people to work towards a common, shared goal [7]. The above definition underscores three dimensions of social capital [9]: (1) social interaction (or network ties), referring to structural links or connections between individuals in a social network; (2) trust, referring to the strength of social relationships developed among individuals in the network that are developed through a history of prior interactions among these members which influence their subsequent behaviors in the network; and (3) shared vision, referring to a set of beliefs and assumptions about organizational work and processes used to perform work that are broadly agreed upon by the organizational community.

In this study, we focus on the relationships between these dimensions of social capital and knowledge sharing (i.e., the outcome) for the purpose of studying the moderating effects of positive affective tone on such relationships in virtual and collaborative work settings. While prior studies have somewhat attested to various effects of social capital on knowledge sharing, none of previous studies has explored the moderating impacts of positive affective tone on the relationship between social capital and knowledge sharing.

### 2.2. Development of hypotheses

This study examines the joint role of social capital and positive affective tone on knowledge sharing among virtual

teams involved in online collaborations, and the moderating effects of the positive affective tone. Specifically, we integrate social capital theory with affective infusion considerations [10,11] to postulate an integrated model that captures the main and moderating effects of positive affective tone during the knowledge sharing formation. The rationale for our hypotheses is provided in the followings.

According to affect infusion model [10,11], affective mood has a strong effect on circumstances that are within complex and ambiguous situations and demand the use of active and constructive processing strategies [10,11]. Given that teamwork has the inherent feature of being complex for individuals to tackle alone, team positive affective tone that helps reduce team members' cognitive complexity [12] becomes a substantial factor on such team dynamics as knowledge sharing. How exactly positive affective tone influences employees' information processing depends on the valence of the affect [13]. In general, positive affective tone tends to facilitate knowledge and information integration [14] and positive interpretation of group issues, such as considering strategic issues as opportunities [15]. Hence, when work teams have a positive affective tone, their members perceive things in an optimistic perspective and therefore are more likely to feel good about coworkers [16] and actively share knowledge with each other. Positive affective tone facilitates good organizational behavior because it influences both what people think (the content of cognition) positively and how people share (the process of cognition) [11]. Collectively, positive affective tone influences not only information processing but also resulting behaviors of knowledge sharing in a team. In light of the above logic and empirical evidence, this study hypothesizes:

**H1**. Positive affective tone is positively related to knowledge sharing in virtual teaming contexts.

The relational dimension of social capital is represented here using the trust construct [17]. Trust can be defined as a willingness of organizational members to be vulnerable to the actions of others due to beliefs in their benevolence, competence, and integrity [18]. Trust has been recognized as the core of knowledge exchange [3,6]. If the interpersonal relationships of a team are poorly maintained, it will undermine trust and even generate mistrust, which will eventually damage such relationships and the potential for learning, knowledge sharing, and knowledge creation [4,7]. On contrary, high levels of trust facilitate effective communication, understanding and sharing because trust improves the quality of dialog, discussion, and comprehension [3,4,9].

Trust is built over time as organizational members engage in repeated interactions with others and learn to rely on them for achieving shared organizational goals and outcomes. Trust is important in the knowledge sharing context because individuals are more likely to share knowledge with others when they perceive others to be trustworthy [19]. Within organizational settings, different mechanisms of trust (e.g., affect-based trust, mutual trust, interpersonal trust, identification-based trust) have been shown to facilitate complex knowledge sharing, from the perspective of both knowledge receivers and knowledge senders [20].

Extending the above research to virtual organizations, Staples and Webster [21] have argued that interpersonal trust in online members is positively associated with the

amount of knowledge sharing within an organization. Others have attributed the chronic lack of knowledge sharing within virtual organizations to the difficulty of developing stable trust among members in a virtual setting [22]. In online knowledge sharing, trust among online members comes into play because requestors must allow themselves to be vulnerable to their online colleagues, for example, by acknowledging their lack of knowledge in a certain domain and seeking the help of others. Likewise, knowledge senders must trust that the shared knowledge will be used appropriately by the knowledge receivers. In other words, the ability to collaborate online relies heavily on extant trust among online members as knowledge sharing cannot occur freely without it. Therefore, we hypothesize:

**H2**. Trust is positively related to knowledge sharing in virtual teaming contexts.

Similar to Tsai and Ghoshal [17], the cognitive dimension of social capital is represented in this paper as shared vision. Shared vision, in the current context of organizational work, represents a set of beliefs and assumptions about organizational work and technologies and processes used to perform that work that is broadly agreed upon by the organizational community. Virtual organizations, often consist of individuals with different educational backgrounds, prior work experiences, and departmental priorities, and hence, often differ in their ways they interpret the same organizational knowledge. For instance, a marketing professional may view increasing accounts receivables as a sign that future sales are increasing; however, an accountant may infer the same data as the organization's inability to collect payments from customers in a timely manner. A shared vision provides a common reference frame for diverse organizational members to assess the validity and utility of existing organizational knowledge and assimilate them within their own organizational work routines in a uniform manner. Without a shared vision, any learning or sharing by individual organizational members is less likely to be meaningfully interpreted, internalized, or used by others within the same organization [23]. Hence, developing a shared vision among organizational members is of strategic importance in knowledge-based organizations. The association between shared vision and knowledge sharing has been partially supported by Hsu et al. [19], who observed that shared values and perceptions are important contributions of complex knowledge sharing. For example, Caterpillar Inc. — a Fortune 100 manufacturer of construction and mining equipments, has been successful by strengthening its shared vision and launching a project of knowledge sharing network, leading to a 200% return-on-investment (ROI) [24]. Another example about McKinsey, the US-based consulting firm, shows that its successful business model is achieved due in part to its shared vision and knowledge sharing (e.g., employees are encouraged to spend time publishing their research and methods). Likewise, Chiu, Hsu, and Wang [24] suggested that the common goals, interests, visions that members of a virtual community share help them see the meaning of their knowledge sharing, which in turn increases the quantity and quality of their knowledge sharing. Based on this rationale and evidence, we hypothesize:

**H3**. Shared vision is positively related to knowledge sharing in virtual teaming contexts.

Social capital theory suggests that social interaction (i.e., structural social capital) reflected by social network ties and configuration is accumulated through the social interconnection that results in a key outcome of group collective behavior (e.g., knowledge sharing) [25]. The previous work by Chiu et al. [24] examined how individuals' social capital significantly influences knowledge sharing in online communities, indicating a positive relationship between social interaction and knowledge sharing. Nevertheless, their research neither considers the joint effect of social interaction and positive affective tone nor examines the potential moderating effects of positive affective tone. While they surveyed unidentified subjects from online communities at the individual-level, this study collects data based on teams (i.e., a team-level analysis) in virtual working contexts to appropriately assure the applications of social capital in virtual teams. Collectively, based on the preceding rationale, the hypothesis regarding social interaction is stated as below.

**H4**. Social interaction is positively related to knowledge sharing in virtual teaming contexts.

While social capital and positive affective tone have respectively positive effects on knowledge sharing, the positive affective tone may also have moderating effects during knowledge sharing formation. Experiences and perceptions of positive affective tone may amplify knowledge sharing in organizations with significant social capital, where team members share knowledge even without tangible benefits (e.g., monetary rewards). Team members' intention to share knowledge may be substantially limited if they do not perceive a positive mood in their team. Although there is no precise empirical confirmation of the moderating effects of positive affective tone, previous literature has hinted at the potential moderating effect of positive affective tone within knowledge sharing contexts, in which the literature indicates that groups composed of members with higher positive affective tone are more likely than those composed of members with lower positive affective tone to have more similarity in perceptions regarding who knows what [26].

The moderating effects of positive affective tone in this study can be exemplified as follows. First, trust is more influential to knowledge sharing among the groups with stronger positive affective tone than the groups with weaker positive affective tone, because high-trust employees take part in more positive behavior (e.g., knowledge sharing) actively when in a positive mood, whereas they tend to be passive of their behavior when in a bad mood (e.g., [27]). The concept of spontaneity in workgroups puts special emphasis on the positive affective tone of primary work teams as an explanation for why trusting cooperative support occurs [28], suggesting that positive affective tone may be an accelerator for the relationship between trust and knowledge sharing.

Second, shared vision is more powerful in facilitating knowledge sharing among the groups with high levels of positive affective tone than the other groups with low levels of positive affective tone, because knowledge sharing via co-creating in groups is a widespread and collaborative process where a shared vision is built in a positive mood of group learning (e.g., [29]). Indeed. Positive affective tone exerts a powerful effect on what team members usually share with each other (e.g., their life or work experiences) (e.g., [30,31]),

which eventually influences the relationship between shared vision and knowledge sharing among team members.

Third, affect infusion model [10,11] suggests that positive emotions may prime positive memories and interactions, which in turn produce such prosocial behavior as knowledge sharing among team members [32]. Indeed, positive affective tone is strongly linked to social interaction tendencies [33] and serves as pleasant distractions for people engaged at a repetitive task of knowledge sharing (e.g., [34]), suggesting a potential moderating effects of positive affective tone on the relationship between social interaction and knowledge sharing. Collectively, above expectations and rationales lead us to propose the following three hypotheses:

**H5**. Positive affective tone positively moderates the relationship between trust and knowledge sharing in virtual teaming contexts.

**H6**. Positive affective tone positively moderates the relationship between shared vision and knowledge sharing in virtual teaming contexts.

**H7**. Positive affective tone positively moderates the relationship between social interaction and knowledge sharing in virtual teaming contexts.

## 3. Methods

### 3.1. Subjects and procedures

The research hypotheses described above were empirically tested using a survey of team leaders in virtual working settings of IT (i.e., information technology) firms in two well-known science parks in Taiwan. This study invited part-time MBA students working professionally in IT industries to help conduct the survey, targeting a total of 28 large IT firms in Taiwan. The IT firms were chosen because these firms represent one of the largest user groups of IT such as e-mail, online conference, and instant messaging for online collaboration and work. A total of 560 questionnaires were distributed to team leaders across these firms for the analysis of team-level in this study, out of which 309 usable questionnaires based on teams were returned for a response rate of 55.18%.

### 3.2. Measures

The constructs in this study were measured using five-point Likert scales adapted from existing literature. These items were reworded to fit the virtual contexts of knowledge sharing by a focus group of five researchers (i.e., three graduate students and two professors) who were well-versed in research of information technology and organizational behavior. The focus group participants also evaluated the appropriateness of each item, and dropped them if necessary. For example, the shared vision item "the strategic decision process is participative" used by Croteau and Raymond [35] was dropped because it did not specifically relate to shared vision, but rather, to the level of participation in organizational decision processes. This study conducted two pilot tests to assess the quality of our measures and improve item readability and clarity. Finally, our questionnaires were also thoroughly examined

for a double check by an outside professor who was not an author of this study.

Knowledge sharing was measured using three items directly drawn from Lin [4]. The shared vision measure employed four items modified from Croteau and Raymond [35]. The three items for the trust construct were adapted from Yilmaz and Hunt [36]. The four items for measuring social interaction were directly drawn from Lin [9]. Finally, positive affective tone was measured using four items drawn from Watson et al. [37]. All scale items are listed in the Appendix.

### 3.3. Data analysis

The survey data were analyzed in two stages. In the first stage, we conducted confirmatory factor analysis (CFA) using SAS to assess scale reliability and validity. In the second stage, we conducted statistical testing with regression models by simultaneously including interaction terms (for testing moderating effects). Test results from each analysis are presented next.

The first stage of our data analysis is confirmatory factor analysis (CFA). The goodness-of-fit of our CFA model was assessed using a variety of fit metrics, as shown in Table 1. The normalized chi-square (chi-square/degrees of freedom) of the CFA model was smaller than the maximum recommended value of 3.0 for confirmatory analysis. The root mean square residual (RMR) was smaller than the maximum recommended norm of 0.05 and the root mean square error of approximation (RMSEA) was smaller than the recommended maximum of 0.08. Although the adjusted goodness of fit index (AGFI) was slightly lower than 0.9., the comparative fit index (CFI), the non-normed fit index (NNFI), the goodness of fit index (GFI), and the normed fit index (NFI) all exceeded the minimum norm of 0.90. Based on the overall fit metrics, our hypothesized CFA model fits well with the empirical data.

**Table 1**
Standardized loadings and reliabilities.

| Construct | Indicators | Standardized loading | AVE | Cronbach's α |
|---|---|---|---|---|
| Knowledge sharing | GP1 | 0.65 (t = 12.29) | 0.66 | 0.84 |
| | GP2 | 0.90 (t = 19.19) | | |
| | GP3 | 0.86 (t = 17.77) | | |
| Trust | TR1 | 0.72 (t = 13.37) | 0.50 | 0.76 |
| | TR2 | 0.77 (t = 14.49) | | |
| | TR3 | 0.63 (t = 11.17) | | |
| Shared vision | SV1 | 0.82 (t = 16.92) | 0.63 | 0.87 |
| | SV2 | 0.80 (t = 16.45) | | |
| | SV3 | 0.81 (t = 16.82) | | |
| | SV4 | 0.75 (t = 14.87) | | |
| Social interaction | SI1 | 0.82 (t = 17.11) | 0.67 | 0.88 |
| | SI2 | 0.87 (t = 18.79) | | |
| | SI3 | 0.86 (t = 18.61) | | |
| | SI4 | 0.71 (t = 14.13) | | |
| Positive affective tone | PA1 | 0.74 (t = 14.91) | 0.68 | 0.89 |
| | PA2 | 0.83 (t = 17.57) | | |
| | PA3 | 0.87 (t = 18.79) | | |
| | PA4 | 0.85 (t = 18.10) | | |

Goodness-of-fit indices (N = 318): $\chi^2_{125}$ = 251.10 (p-value < 0.001); NNFI = 0.95; NFI = 0.93; CFI = 0.96; GFI = 0.92; AGFI = 0.89; RMR = 0.01; RMSEA = 0.06.

Convergent validity was assessed using three criteria recommended by Fornell and Larcker [38]. First, as seen from the t-statistics in Table 1, all factor loadings were statistically significant at p < 0.001. Second, the average variance extracted (AVE) for all constructs exceeded or equaled 0.50, indicating that our hypothesized items captured more variance in the underlying construct than that attributable to measurement error. Third, Cronbach alpha for each construct exceeded 0.70, assuring reliability for each of our hypothesized constructs. Hence, the three criteria required to assure convergent validity were met in our analysis.

Discriminant validity was assessed using pair-wise chi-square difference tests between an unconstrained model, where all constructs in our CFA model were allowed to co-vary freely, with constrained models, where covariance between each pair of constructs was fixed at one. Controlling for experiment-wise error rate by setting the overall significance level to 0.01, the Bonferroni method indicated that the critical value of the chi-square difference should be 10.83. In our CFA model, chi-square difference statistics for each pair of constructs exceeded this critical value of 10.83 (see Table 2), thereby assuring discriminate validity for our data sample. The above analysis gave us confidence that the research instruments used to measure the constructs of interest in this study were indeed statistically adequate.

The second stage of our data analysis involved examining the significance and strength of each of our hypothesized effects. This analysis was done using two regression models. The first model examined the main effects specified in hypotheses H1-H4, whereas the second model added the moderating effects hypothesized in H5, H6 and H7. Test results of each model are shown in Table 3.

Three out of the four hypothesized associations in our main effects model (see model 1 of Table 3) were significant at the p < 0.05 or p < 0.01 significance levels. Knowledge sharing was positively affected by positive affective tone (β = 0.24; p < 0.01), trust (β = 0.18; p < 0.01), and shared vision (β = 0.20; p < 0.01), indicating that H1, H2 and H3

**Table 2**
Chi-square difference tests for examining discriminant validity.

| Construct pair | $\chi^2_{125} = 251.10$ (unconstrained model) | |
|---|---|---|
| | $\chi^2_{126}$ (constrained model) | $\chi^2$ difference |
| Knowledge sharing, trust | 403.98*** | 152.88 |
| Knowledge sharing, shared vision | 571.47*** | 320.37 |
| Knowledge sharing, social interaction | 622.55*** | 371.45 |
| Knowledge sharing, positive affective tone | 582.41*** | 331.31 |
| Trust, shared vision | 383.03*** | 131.93 |
| Trust, social interaction | 386.80*** | 135.70 |
| Trust, positive affective tone | 367.66*** | 116.56 |
| Shared vision, social interaction | 551.03*** | 299.93 |
| Shared vision, positive affective tone | 716.86*** | 465.76 |
| Social interaction, positive affective tone | 783.20*** | 532.10 |

*** Significant at the 0.001 overall significance level by using the Bonferroni method.

**Table 3**
Team-level test results.

| | Model 1 | Model 2 |
|---|---|---|
| | Knowledge sharing | Knowledge sharing |
| Control variables | | |
| Gender | 0.08 | 0.07 |
| Age | −0.01* | −0.01 |
| Education | −0.02 | 0.01 |
| Antecedents | | |
| Positive affective tone | 0.24** | −1.49* |
| Trust | 0.18** | −0.64 |
| Shared vision | 0.20** | −0.34 |
| Social interaction | −0.04 | −1.04* |
| Interaction terms | | |
| Trust * positive affective tone | | 0.20* |
| Shared vision * positive affective tone | | 0.13 |
| Social interaction * positive affective tone | | 0.25** |
| Adj R² | 0.30 | 0.31 |

* p < 0.05.
** p < 0.01.

were supported. However, knowledge sharing was insignificantly related to social interaction, and thus H4 was not supported. Regarding the moderating effects of positive affective tone (see model 2 of Table 3), the relationship between trust and knowledge sharing was significantly moderated by positive affective tone (β = 0.20; p < 0.05) (H5 was supported), while the relationship between shared vision and knowledge sharing was not moderated by positive affective tone (H6 was not supported). Finally, the relationship between social interaction and knowledge sharing was significantly moderated by positive affective tone (β = 0.25; p < 0.01) (H7 was supported).

The unsupported relationship between social interaction and knowledge sharing is surprising in particular and may be caused due to our inclusion of positive affective tone in this study. When positive affective tone is taken into account, it is possible that the effect of this construct may dominate that of social interaction such that it may render the social interaction effect non-significant. Nevertheless, further examination is warranted before any definitive conclusion can be drawn in this regard.

## 4. Discussion

### 4.1. Implications for research

The study was one of the first to jointly examine the roles of social capital and positive affective tone in a single holistic model. The findings of this study help expand the scope of social capital theory by integrating positive affective tone into the theory. Anecdotally, it is recognized in workplaces that the relationship between social capital and knowledge sharing in a strong positive affective tone becomes tighter than that in a gloomy mood. Interpersonal responses related to trust, shared vision and social interaction will have only weak effects on knowledge sharing if management cannot effectively help team members foster their positive affective tone in workplaces. Employees are social beings and have

their own affective tone, and thus their affective considerations (i.e., positive tone) may sometimes dominate over social considerations (i.e., trust, social interaction, and shared vision) in shaping their knowledge sharing. Our empirical analysis demonstrated that when positive affective tone (an emotional consideration) are taken into account, the effect of social interaction (a social capital dimension) on knowledge sharing among virtual members tends to wear out, though the same cannot be said for trust and shared vision (another two dimensions of social capital). These effects points to a complex and intricate pattern of relationships between people's affective tone and social predictors of knowledge sharing, which may be the subject of more detailed investigations in the future. Furthermore, the social-affective duality, which seems very plausible from logical and empirical perspectives, is not reflected in most contemporary models of knowledge sharing. This offers a unique opportunity for theory building in this area. Note that social-affective duality is defined as two key pivots (i.e., social capital and positive affective approaches) that jointly achieve quality knowledge sharing. It is a must that management should improve both the pivots at the same time to facilitate their knowledge sharing.

Second, an interesting finding of our study not evident from prior research is the significant moderating effects of positive affective tone on the relationships between trust and knowledge sharing and between social interaction and knowledge sharing. Although we found evidence for direct main effects of shared vision and positive affective tone in our main effects model (see model 1 of Table 3), such main effects may not be meaningfully interpreted in the presence of significant moderating effects (see model 2 of Table 3). Empirical evidence of these moderating effects, as observed in this study, is all the more reason why we should not examine the effects of social capital or employees' affective considerations in isolation, but rather in conjunction within a larger holistic model of knowledge sharing.

### 4.2. Implications for practice

Our analysis demonstrated that knowledge sharing can be improved by facilitating social capital between online members, and indirectly by strengthening their perceptions of positive affective tone. This duality between social capital and positive affective tone, albeit unexplored in prior research, presents unique challenges for virtual team managers interested in improving knowledge sharing among their online team members. Hence, managers must strive to build a culture of knowledge sharing within their organizations, by promoting a shared vision and trust-building opportunities, while also simultaneously communicating the benefits of knowledge sharing to their organizational members. For example, Target corporate, the second-largest U.S. discount retailer, demonstrated strong and positive employee feedback in every field, with the strongest employee positive affective tone (or happiness) in senior management and compensation according to a business survey in 2011. Such employee feedback is a key check-point for management to recognize if trust and shared vision are appropriately present. Managers in Target corporate do their best to foster a culture of sharing where team members feel valued and rewarded, consequently strengthening their vision sharing and knowledge sharing. Meanwhile, knowledge sharing

can be accomplished if interpersonal trust among team members is promoted by their working together to improve team cohesiveness, communication styles, agreeable and extravert styles [39].

Given the multiplicative nature of the effects of social capital and positive affective tone, organizational initiatives that are directed only at either building social capital or fostering employees' positive moods are likely to be of limited help in enabling knowledge sharing, than those that address both issues concurrently. For instance, Starbucks corporate increases its competitive advantage by putting emphasis on its employees' positive affective tone, shared vision, and knowledge sharing. More specifically, Starbucks corporate emphasizes the "employee experience matters" at Starbucks because the company recognizes competitors can replicate the product Starbucks serves, but competitors can't replicate the Starbucks happy employees having quality shared vision and knowledge sharing to create their success.

Second, the relationships between social capital, positive affective tone, and knowledge sharing are even more critical and challenging for "virtual teams" where knowledge workers employ IT to interact with each other and perform their job. Many specialized work team tasks, such as new product design, often cannot be accomplished by any single person, and are assigned to and require the collective effort and knowledge sharing among multiple knowledge workers. Furthermore, social capital formation (i.e., building a shared vision or trust) is difficult in online settings, such as between product design engineers from supplier and manufacturing firms, where virtual members rarely interact face-to-face, but rely almost entirely on online technologies such as e-mail and groupware to accomplish their shared goal. Courses for the purpose of training and education should be designed for team workers to learn to establish positive atmosphere of organizational affective tone. These courses may cover emotional intelligence, impression management, group building, team communication, and emotional control, etc.

Management can improve the atmosphere that fosters knowledge sharing in virtual contexts by applying the approach of sensemaking [40,41]. Sensemaking is a process aimed at observing and interpreting the meaning and relevance of prior experience [40]. In virtual teaming contexts, sensemaking can be triggered when positive affective tone (i.e., a cue) involves something out of the ordinary [41]. Abnormal affective tone can create arousal, which we recognize as curiosity or a need to interpret what has happened in a virtual team [40,41]. In other words, weak positive affective tone is likely to be interpreted as a cue with which there are some kinds of problems, and inspires more intensive sensemaking [41], consequently motivating to seek solutions to increase positive affective tone and improve the atmosphere in virtual contexts.

In conclusion, we proposed a theoretical model of knowledge sharing in the context of online work, by integrating the dual perspectives of social capital and employees' affective tone. Our hypothesized model was empirically validated using a field survey of virtual team leaders in information technology firms in Taiwan. Pinsonneault & Caya [42] noted that very few studies exist on knowledge sharing within a virtual context and proposed an agenda for future research on online collaboration. We hope that our research serves as a

first step towards building a comprehensive body of knowledge in this area.

### 4.3. Limitations of the study

As with any empirical study, this study suffers from several limitations. The first limitation is the possibility of common method variance (CMV), given that all predictors in our research model were measured perceptually at a single point in time. To test for this bias, we conducted Harman's single factor test [43]. In our post-hoc factor analysis, substantial common method variance was not present in the data sample, because neither a single factor emerges from an exploratory factor analysis nor a general factor accounted for the majority of the covariance in the independent and dependent variables. In other words, the lack of a single dominant factor explaining most of the variance in this study indicated that potential common method variance was not a substantial problem in our observed data. Nevertheless, it is important to note that our hypotheses for testing moderating effects have the advantage and benefits of mitigating the CMV problem. Previous literature indicates that more complex relationships (e.g., moderating effects or interaction effects) are less susceptible to CMV because such relationships are less likely to be part of respondents' cognitive maps [44].

The second limitation of this study is its generalizability. Due to the highly delimited nature of our subject sample (virtual team leaders in IT organizations in Taiwan), inferences drawn from our data may not be fully generalizable to employees in organizations of other types (e.g., financial industry) or those from other countries. Indeed, employees in Eastern countries share a collectivist culture and may be more predisposed to sharing knowledge and working in a collective manner, compared to the West, where the predominant work culture is individualistic and driven by personal considerations. Likewise, given the high rate of change in the IT industry, people operating in this sector often have no choice but to share knowledge just to keep themselves abreast of technological changes and trends. Such macro- and micro-level cultural considerations should be taken into account if future researchers wish to replicate or expand our analysis in the non-IT sector or in Western organizations.

Finally, practical empirical considerations relating to field-based data collection restricted the set of variables examined in this study and in a cross-sectional study. There may be other predictors of knowledge sharing, such as workplace cultures, organizational size, and so forth, that may be important yet ignored in this study. Future studies should attempt to identify these variables and consider their inclusion in empirical models as independent, moderating, or control variables, and also attempt to examine the hypothesized relationships using longitudinal data.

### Appendix. Measurement items

Knowledge sharing (source: Lin [4]).

KS1. We share my expertise at the request of our online team members.
KS2. We share my job experience with our online team members.

KS3. We share my ideas about jobs with our online team members.

Positive affective tone (source: Watson et al. [37])
When we think/talk about our online team, our feelings and emotions are…

PA1. excited
PA2. enthusiastic
PA3. inspired
PA4: active

Trust (source: Yilmaz and Hunt [36])

TR1. We consider our online team members as people who can be trusted.
TR2. We consider our online team members as people who can be counted on to do what is right.
TR3. We consider our online team members as people who are always faithful.

Shared vision (source: Croteau and Raymond [35])

SV1. The mission of our online team is clear for every member.
SV2. The objectives of our online team are coherent for every member.
SV3. The strategy of our online team is explicit for every member.
SV4. There is a strong feeling that a common commitment exists in our online team.

Social interaction (source: Lin [9])

SI1. We have close social relationships among online co-workers.
SI2. We spend a lot of time interacting with each other in our online workgroup.
SI3. We have frequent contact with our online co-workers.
SI4. We feel strong cohesiveness of our online workgroup.

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