



## Journal of Organizational Effectiveness: People and Performance

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### Article information:

To cite this document:

Luo Lu , (2015), "Building trust and cohesion in virtual teams: the developmental approach", Journal of Organizational Effectiveness: People and Performance, Vol. 2 Iss 1 pp. 55 - 72

Permanent link to this document:

<http://dx.doi.org/10.1108/JOEPP-11-2014-0068>

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# Building trust and cohesion in virtual teams: the developmental approach

Building trust  
and cohesion  
in virtual  
teams

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## Abstract

**Purpose** – Using the developmental process of interpersonal relationships as a metaphor, the purpose of this paper is to examine the mediating effects of trust and cohesion on the links between psychosocial factors and work outcomes among Chinese employees.

**Design/methodology/approach** – A three-wave survey method was used to collect data from 388 full-time employees working in virtual teams in diverse industries in Taiwan.

**Findings** – Structural equation modeling confirmed that trust and cohesion were two key psychological mechanisms linking up team psychosocial factors (i.e. psychological similarity, shared activities) and work outcomes (i.e. job satisfaction, team performance).

**Practical implications** – This study examined virtual teams, which are increasingly prevalent in cloud computing applications, from a largely overlooked social psychological perspective. The results clearly demonstrated that the development and functioning of work teams is similar to the formation and functioning of social relationships. Thus, psychology in general, social psychology in particular, should have a lot to contribute to the better understanding of the rich dynamism of work teams, virtual and face-to-face.

**Originality/value** – This is the first study testing a comprehensive model of the process of attraction-identification-trust-performance in the virtual team context with a non-western sample. The unique individual-level analysis underlining the human factors complements more often taken approach of organization- and/or team-level analysis of virtuality tackling structural and strategic issues.

**Keywords** Team cohesion, Team psychosocial factors, Team trust, Virtual teams, Work outcomes

**Paper type** Research paper

At the turn of the century, responding to the increasing trend of virtuality in organizations and its challenge on human resource management, Sparrow and Daniels (1999) argued for the need of approaching “virtuality” across different levels of analysis. In their proposed research agenda, three separate levels of analysis each focusing on different phenomena were delineated: at the organizational level, issues such as organizational structure and strategy are best tackled; at the workforce level, issues such as innovative ways of working and learning are best tackled; at the individual level, issues such as organizational behavior associated with the virtual organization are best tackled. Unfortunately, not much empirical research has ensued; psychologists in particular, have not contributed to the understanding of virtuality in organizations as much as they might. To redress this balance, the present study adopts a social psychological perspective, and undertakes an individual-level analysis, to map out the developmental process in the emerging context of virtual work teams.

Recent advances in technology have enabled people working in remote locations to send almost instantaneous messages (e.g. e-mailing) or see and hear one another



Journal of Organizational  
Effectiveness: People and  
Performance  
Vol. 2 No. 1, 2015  
pp. 55-72

© Emerald Group Publishing Limited  
2051-6614  
DOI 10.1108/JOEPP-11-2014-0068

This research was supported by a grant from the National Science Council, Taiwan, ROC, NSC101-2410-H-002-197-MY2.

(e.g. videoconferencing). In other words, nowadays people can work in virtual teams that “meet” only electronically. Virtual teams unite physically dispersed members and achieve a common goal. In the present study, virtual teams are defined as groups of individuals who work across time, space and organizational boundaries with links strengthened by webs of communication technology (Lipnack, 2000, p. 352). Virtual team members may have never met face-to-face. This form of work team is a thrust of cloud computing application, allowing people to collaborate on-line, providing services, using services, and coordinating activities of service providers to meet needs of the end-users. In fact, in today’s techno-world, nearly all teams do at least some of their work remotely, thus findings in the present study may have more general bearings on virtuality in organizations.

Despite the ubiquity of computer supported cooperative work (CSCW), scientific research on virtual teams is scarce. What we do know is that there are substantial differences between face-to-face live communications and those involved in CSCW (Coovert and Thompson, 2001). For example, people working together via e-mail, compared to live interaction, are less inhibited in conveying hostile comments and making more negative remarks of one another. They are also less likely to conform to one another’s opinions, have more trouble reaching consensus, and coordinating their efforts. Research summarized in a meta-analysis of 52 studies that compared face-to-face with virtual groups corroborated the above observations, showing that the virtual groups had worse task performance, took more time to complete tasks, and had lower group member satisfaction (Baltes *et al.*, 2002).

It thus seems that although this new work arrangement making use of the advancing computer technology has some advantages, e.g., saving on overhead costs *vis-à-vis* co-located teams, virtual teams face some specific challenges. To further complicate the matter, though businesses now have a variety of computer-based technologies for collaboration among virtual team members, convenience, accessibility, and cost issues have so far compelled businesses to use lean channels such as e-mail, instant messaging, shared document folders, and discussion forums for the bulk of collaboration. Virtual team collaboration may suffer because there is less social rapport and direct social interactions among members. We already know from numerous social psychological studies that shared activities and direct interactions are catalyst for meaningful human relationships both within and between social groups which people belong to DeLamater and Myers (2007). As postulated in the “contact hypothesis”, through sustained and personal contact, the likelihood of inter-group conflict may be reduced (Amir, 1976). Recent empirical evidence further revealed that real-life contacts can foster more favorable and long-lasting attitudes towards the target person or social group (Lu, 2010; Schwartz and Simmons, 2001). Exactly in this context of social interaction, virtual teams may suffer the most as their members have typically not met, thus have no personal contacts. With no prior basis of personal relationships, virtual team members tend to be more task-oriented and exchange less social-emotional information, which further depletes social rapport (Martins *et al.*, 2004). Understandably, they consequently report less satisfaction with the group process than do members of face-to-face teams (Martins *et al.*, 2004).

As virtual team is still a new phenomenon, there needs to be concerted research efforts to find out how people can most effectively work in such arrangements, in order to make the best use of the emerging cloud computing technology. Kahai *et al.* (2007) have proposed a research agenda looking at basic differences between virtual worlds and other media. Their proposal mainly stems from the

Media Richness Theory and its extensions, with a clear technical focus aiming at designing the most effective computer-mediated communication (CMC) systems. However, still not sufficient attention has been paid to people and their interactions albeit “virtual” in these virtual worlds.

### Making effective virtual teams: a solution with people orientation

To make virtual teams work, scholars have suggested that:

- (1) trust needs to be established among members, as one insulting e-mail from a team member can severely undermine the team spirit (Wilson *et al.*, 2006);
- (2) team process needs to be closely monitored, so that the team stays together and continue to work for a common goal (Malhotra *et al.*, 2007);
- (3) better training needs to be provided to coach people to be more effective users of CSCW (Coovert and Thompson, 2001); and
- (4) better design of the technology (Coovert and Thompson, 2001).

These may all be sound advices, empirical evidence is still lacking. Furthermore, a more integrated theoretical framework needs to be developed to tie up findings from scattered studies, so that key aspects of virtual team management can be delineated and explained. Upon such a scientific basis, managerial applications can then be formed and evaluated.

To this end, the current study purports a solution with a firm people orientation, to respond to the aforementioned suggestions Nos 1 and 2 which pertain to interpersonal interactions and group dynamism within virtual teams. Our overarching framework is built upon psychological theories and research on social relationships and group dynamism (shown in Figure 1). This is to provide a solid theoretical basis for an individual-level analysis of potential social cognitive mechanisms involved in virtual teams (Sparrow and Daniels, 1999). Applying such a psychological model to the virtual work team context, I focused on key aspects of the developmental process for an effective work team while omitting certain features of pure social interactions. This is because these features occur in co-located teams but not in virtual teams (e.g. it is not possible for people to go out for dinner or drinks after work if they do not share a work location). Figure 2 shows the process model being tested.

The use of interpersonal relationship development as a metaphor for understanding virtual teams is further justified by existing research in the field.

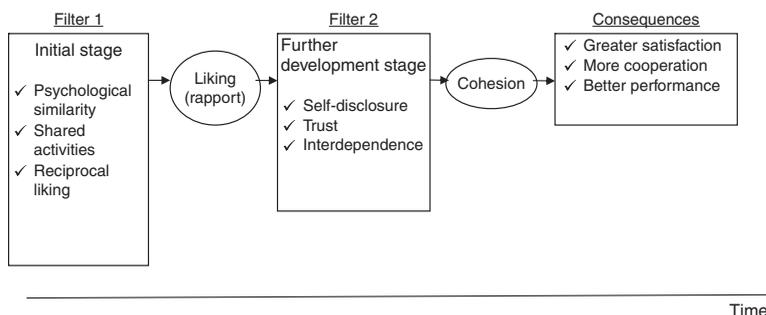
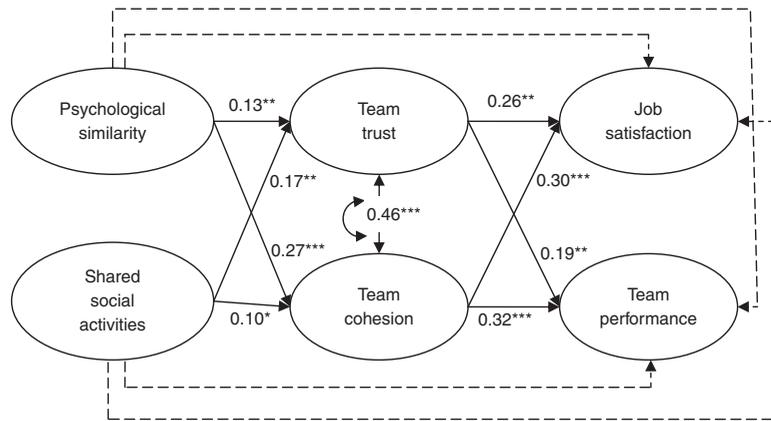


Figure 1. The generic model of the development of social relationships

**Figure 2.**  
The research model for developing effective teams (incorporating results of the SEM analysis)



Having reviewed 43 earlier studies on virtual teams, Powell *et al.* (2004) concluded that researchers focused on four main areas:

- (1) inputs, including aspects of the virtual team design, cultural differences, technical expertise of and training available for the team members;
- (2) socio-emotional processes, including relationship building, cohesion and trust;
- (3) task processes, including communication, coordination, and task-technology-structure fit; and finally
- (4) outputs, including performance and satisfaction.

The purpose of the present study is to uncover the psychological mechanisms underlying the socio-emotional processes in virtual teams, and to link them with attitudinal (i.e. satisfaction) as well as performance outputs.

**Building team trust and cohesion: a process model**

Once people are assigned or voluntarily join a team, they start making contact and begin to interact, real or virtual. Several factors will determine the extent to which one member will like his/her teammates, much like the way two strangers attract to each other, as depicted in Figure 1. Three key factors at this initial stage have been identified in the social psychological research of interpersonal attraction, these are, psychological similarity, shared social activities, and reciprocal liking (DeLamater and Myers, 2007). Through this set of filters (Filter 1), attraction and liking develops between two people. Just as two people may then decide to take their relationship to a different level, team members may decide to strengthen their commitment to the group, and move onto the further development stage. At this stage, another set of filters (Filter 2), will be enacted, including more and deeper self-disclosure, trust in teammates, and interdependence among members for gratifications and reinforcements. Through this set of filters, cohesion (both social and task) develops and strengthens. This powerful binding force will then create more constructive consequences for the team, including heightened satisfaction of the team process, more cooperation and coordination among team members, and eventually better performance of the team as a whole. Below I will elaborate on this dynamic flow of developmental process for building an effective team, using trust and cohesion as focal group mechanisms linking interactions among members with work outcomes.

At the initial stage, similarity is a key filter for relationship development, and psychological similarity – the sharing of beliefs, opinions, likes, and dislikes, is perhaps the most important kind (DeLamater and Myers, 2007). Social psychological experiments using the attraction-to-a-stranger paradigm generally found that the participants' attraction to the stranger is positively related to the percentage of attitude statements by the strangers that agree with the participant's own attitudes (Byrne and Nelson, 1965; Gonzales *et al.*, 1983). Of course, we rarely agree with our friends about everything, what matters is that we agree on a high proportion of issues. This relationship between attitudinal similarity and liking is very robust; it has been replicated in studies using both men and women as participants and strangers under a variety of conditions (Berscheid and Walster, 1978).

For members of a virtual team, working with a teammate whom you have never met personally is like interacting with a stranger in a social situation. Attitudinal similarity may help to nurture interpersonal liking thus building team rapport through two psychological mechanisms. First, we desire for consistency between our attitudes and perceptions. If you have positive attitudes towards certain objects and discover that another person has favorable attitudes towards the same objects, your cognition will be consistent if you like that person (Newcomb, 1971). Thus our desire for consistency attracts us to persons who hold the same attitudes towards important objects. Second, we prefer rewarding experiences and our interaction with people of the same feather usually leads to positive outcomes (Lott and Lott, 1974). More profoundly, similarity validates our view of the world, and enables us to deal with the world more confidently (Byrne, 1971).

As people interact, they share activities. Shared activities not only supply contexts for people to reveal their own and discover others' important values and attitudes, they also provide opportunities for potentially rewarding experiences. Research has shown that participation in mutually satisfying activities is a strong influence on the development and maintenance of relationships (Aron *et al.*, 2000). Since face-to-face meetings are not possible or feasible in virtual teams, shared social activities may be done partially via electronic communication tools, such as on-line chatting, sharing blogs, and playing on-line games. Jarvenpaa and Leidner (1999) found that if teams communicate more socially they achieve higher trust and better social and emotional relationships.

This is because through various work and non-work interactions, reading and interpreting positive and negative feedbacks received, people will have a fairly good grasp of how their team members feel about them. One of the most consistent research findings in social psychology is that we like people who like us in return (Backman, 1990). In most relationships, we expect the reciprocity of attraction; the greater the liking of one person for the other, the greater the other person's liking will be in return. Thus, a mutuality of liking is achieved to form the basis for the relationship to grow. Although in the work context, liking is not prerequisite to work effectively towards task completion, workplace friendships can foster opportunities for developing social rapport and positive team dynamism (Tse and Dasborough, 2008).

As a relationship grows, self-disclosure increases (Bradford *et al.*, 2002). The same may happen in teams: as members become familiar with and grow fonder of one another, exchanges of social-emotional information may increase. These social chats and gossips may serve to bind members at the socio-emotional level, supplementary to the formal team assignment (Foster, 2004; Jarvenpaa and Leidner, 1999).

One thing more important happening at this developmental stage of a personal relationship is the building of trust between the two people. When we trust someone,

we believe that the person is both honest and benevolent (Larzelere and Huston, 1980), as well as reliable and predictable (Johnson-George and Swap, 1982; Rempel *et al.*, 1985). Research has found positive associations among trust, self-disclosure, and intimacy (Larzelere and Huston, 1980). While trust is noted to be crucial in successful organizations and teams (Dirks and Ferrin, 2001; Simons and Peterson, 2000), it is particularly problematic with virtual teams, because it is arguable whether people can be expected to trust each other if they have never met face-to-face. Nonetheless, as virtual team members are geographically dispersed to work on interdependent tasks, trust is crucial for both accomplishing the common goal and holding the group together. This is because virtual teams members have to rely on others' expertise (knowledge sharing) and accountability (fulfillment of promises) to complete tasks; furthermore, members' good will sustains the team itself as a meaningful entity (Jarvenpaa and Leidner, 1999).

With trust, frequent and deeper interactions between people, interdependence increases (Kelley *et al.*, 1983). That is the increasing reliance on one person for gratifications and decreasing reliance on others. When a deeper level of mutuality is reached among team members, they become increasingly reliant on teammates for getting work done, as well as for gratifying their social psychological needs outside of work, such as friendship and leisure/hobby pursuits. In the team context, this further development stage is completed when strong team cohesion is perceived and desired among team members.

Group cohesion refers to the extent to which members of a group desire to remain in that group and resist leaving it (Balkwell, 1994). It is a sense of unity; and for a group to be highly cohesive, most if not all of its members must have strong motives to remain in the group (Spector, 2006). One of the most fundamental types of group cohesion is social cohesion, that is members stay in the group primarily because they like one another as persons and desire to interact with one another (Aiken, 1992). As I explained earlier, similarity increases liking, thus other thing being equal, social cohesion will be greater when group members are similar. The other type of group cohesion is task cohesion. When a group has high task cohesion, its members remain together primarily because they are heavily involved with the group's tasks. Task cohesion will be greater if members identify with the group's tasks and find them intrinsically rewarding and valuable. It will also be greater if the group's goals and the related tasks are clearly defined (Raven and Rietsema, 1957).

A high level of group cohesion has important implications for group behavior. First, cohesion affects both the amount and quality of interaction among members. In general, research has found that members of highly cohesive groups communicate more with one another than do members of less cohesive groups, and this holds true for a wide variety of groups (Moran, 1966), including virtual teams (Jarvenpaa and Leidner, 1999). Furthermore, interaction among members in highly cohesive groups is usually friendlier, more cooperative, and entails more attempts to reach agreements and to improve coordination (Shaw and Shaw, 1962). This is because members of highly cohesive groups care about belonging to the group and want their group to perform well, so they exercise more influence on one another to bring about coordination and consensus in the group. The preponderance of evidence in group research indicates that cohesion tends to increase the productivity and performance of groups (Evans and Dion, 1991; Gully *et al.*, 1995; Mullen and Copper, 1994).

In the team context, especially for virtual teams of dispersed members working in different geographical locations, for different organizations, and even different sectors

of the economy, effective communication and close coordination is vital for accomplishing the common goals (Powell *et al.*, 2004). A team with high cohesion can achieve this end through adopting a norm for high productivity and creating a better synergy of its members' efforts. Indeed, a recent meta-analysis suggests that cohesiveness has a positive correlation with job performance in work groups (Beal *et al.*, 2003). Using team commitment as a broader but related concept to cohesion, researchers also found that it is positively related to team performance (Bishop *et al.*, 2000). Furthermore, recent studies revealed that team commitment was related to co-worker and supervisor satisfaction, organizational commitment (Bishop and Scott, 2000), general job satisfaction and team satisfaction (Van Der Vegt *et al.*, 2000). In practice, cohesive teams will be committed teams.

To sum, decades of social psychological research on interpersonal attraction and group process has informed us a possible development dynamism for work teams, including virtual teams, as depicted in Figure 1. However, no empirical study has tested this generic model which integrates knowledge from interpersonal attraction and social group research. Existing work group (team) research has largely focused on group cohesion and productivity (Spector, 2006), overlooking the developmental antecedents of cohesion. In particular, while researchers have highlighted the importance of cohesion in virtual teams, there is no consensus as to how to foster it effectively (Powell *et al.*, 2004). Keeping in mind that "getting work done" is the primary purpose of a work team and "making friends" is only secondary, the generic relationship development model shown in Figure 1 needs to be condensed to reflect the contrasts in priority. I thus decided to focus on the key factors conducive to fostering a cooperative work climate, while omitting those non-work-related psychosocial features. As shown in Figure 2, an integrative model extracted from Figure 1 delineates the nexus of "psychological similarity/shared activities – trust – cohesion – consequences". Specifically, the following hypotheses were tested in a three-phase study:

- H1.* Both perceived psychological similarity and shared social activities will be positively associated with perceived trust and cohesion in the team.
- H2.* Both perceived trust and team cohesion will be positively associated with job satisfaction and team performance.
- H3.* Both perceived trust and team cohesion will mediate the relationships between psychological similarity/shared activities and job satisfaction/team performance.

## Method

### *Participants and procedures*

The participants in this study were full-time employees working in different organizations of diverse industries in Taiwan. I employed a three-phase design to examine *H1-H3*, addressing the developmental process for an effective virtual team. At Time 1, scales measuring perceived psychological similarity and shared social activities with team members were administered. At Time 2, scales measuring perceived trust for team members and cohesion of the team were administered. At Time 3, scales measuring job satisfaction and team performance were administered. All the research constructs were assessed at the individual level (i.e. as personal perceptions, details below), thus analysis was conducted at the same level. I recruited participants from executive training programs in several universities in Taiwan to maximize both the heterogeneity and retention of the sample.

At Time 1 (T1), along with the first questionnaire, each participant received a cover letter informing them the purpose of the study, the commitment required, and assuring them of anonymity. Participants completed structured questionnaires at their training classes to maximize the response rate. They also received a gift of appreciation for their participation in each wave of the data collection. At the end of the three-wave study period, a total of 388 participants had complete data sets (retention rate of 89 percent). As a precaution, I systematically examined differences between respondents in the panel sample and the dropouts with regard to demographic characteristics as well as the mean scores on the available variables (data from T1 and T2). Analyses revealed no significant differences. I thus concluded that no serious selection problems due to panel loss had occurred.

The study sample was 51.80 percent male and 48.20 percent female, with a mean age of 33.56 ( $SD = 7.09$ ), and mean job tenure of 5.00 years ( $SD = 4.70$ ). Over half of the sample (56.10 percent) was married. Over half of the respondents (79.90 percent) were non-managers. More people worked in manufacturing and medical/health care (41.80 percent for both), service (19.30 percent) than other industries (e.g. education, finance).

All participants had experiences of working in virtual teams, operationalized as “non-collocated teams” (i.e. members based in more than one geographical location). This lenient inclusion criterion is necessary as strictly defined virtual teams are still a rarity. Participants were asked to target their most recent virtual team experiences while answering the questionnaires. The average identified team size was 14 people.

### *Instruments*

The questionnaire survey was administered in Chinese, and whenever possible, I used measures which have been validated in previous studies with Chinese samples. The references for the Chinese version will be given along with the original English version when every scale is introduced below.

*Psychological similarity.* The Deep-level Psychological Fitness Scale (Chou *et al.*, 2005) was used to assess perceived similarity of team members (four items; e.g. “Do you think that your team members are similar to you in general attitudes and values?”). This scale is originally developed in Chinese and validated in Taiwan. Each item was rated on a five-point scale (1 = strongly disagree, 5 = strongly agree), with high scores representing more perceived psychological similarity of team members. In the present study, the internal consistency  $\alpha$  was 0.80.

*Shared social activities.* To assess the frequency of shared social activities among team members, I developed nine items encompassing non-work-related team activities (e.g. “I exchange interesting life style information with my team members”, “I use FB or other social media to maintain friendship with my team members”, “I pursue recreational interests with my team members”). Each item was rated on a five-point scale (1 = very rare, 5 = very often), with high scores representing more frequent reported social interactions with team members. In the present study, the internal consistency  $\alpha$  was 0.89.

*Team trust.* The Trust Scale (Robinson, 1996; Huang, 2002 for the Chinese version) was adapted to assess avowed trust for team members (seven items; e.g. “I believe my team has high integrity”, “I don’t think my team treats me fairly”, reversed score). Each item was rated on a six-point scale (1 = strongly disagree, 6 = strongly agree), with high scores representing more avowed trust for team members. In the present study, the internal consistency  $\alpha$  was 0.87.

*Team cohesion.* The Group Integration Scales (Chang and Bordia, 2001; Chang *et al.*, 2003 for the Chinese version) was used to assess cohesion in the team (seven items; e.g. “My team united in trying to reach the goal for performance”, “My team members stick together outside of the team project”). Each item was rated on a five-point scale (1 = strongly disagree, 5 = strongly agree), with high scores representing more perceived cohesion in the team. In the present study, the internal consistency  $\alpha$  was 0.84.

*Job satisfaction.* Job satisfaction was assessed by three items drawn from Michigan Organizational Assessment Questionnaire (MOAQ) developed by Cammann *et al.* (1979); Lu *et al.* (2010) for the Chinese version; e.g. “All in all, I am satisfied with my job”). Each item was rated on a six-point scale (1 = strongly disagree, 6 = strongly agree), with high scores representing higher job satisfaction. In the present study, the internal consistency  $\alpha$  was 0.87.

*Team performance.* The five-item Overall Performance Subscale from the Team Performance Scale was used to assess team performance (Hoegl *et al.*, 2004; Wu, 2010 for the Chinese version; e.g. “Up to now, my team has achieved all the goals”, “The performance of my team at this moment is satisfactory”). Each item was rated on a five-point scale (1 = strongly disagree, 5 = strongly agree), with high scores representing better team performance. In the present study, the internal consistency  $\alpha$  was 0.90.

In addition, information on sex (coded female = 0, male = 1), education (in years), tenure on the job, job position (coded managers = 1, non-managers = 0), team size, and team history (in years) were recorded. These were included as control variables in the analysis.

### *Data analysis*

According to the hypothesized research model (Figure 2), similarity and activities are treated as antecedents, trust and cohesion are mediators, and job satisfaction and team performance are consequences. Correlation analyses were employed as an initial test of the hypotheses. Structural equation modeling (SEM) was used for model testing. As suggested by Anderson and Gerbing (1988), a two-step approach to SEM analysis was employed in the current study. Measurement models were first tested to examine the distinctiveness of the measures, then the nested structural model test was employed to test the research hypotheses.

## **Results**

### *Confirmative factor analysis*

To ensure whether all variables in the study were distinct constructs, and the results were not caused by potential impact of common method variance, I compared measurement models combining data from all three waves. I compared a hypothesized six-factor model (measurement model, similarity, activities, trust, cohesion, job satisfaction, and team performance are six distinct factors) with four alternative models: three different five-factor models (combining similarity and activities; or combining trust and cohesion; or combining job satisfaction and team performance), four-factor model (combining similarity and activities, combining trust and cohesion), three-factor model (combining similarity and activities, combining trust and cohesion, combining job satisfaction and team performance), and one-factor model (combining similarity, activities, trust, cohesion, job satisfaction, and team performance). The results suggest that the six-factor measurement model ( $\chi^2 = 838.20$ ,  $df = 517$ ,  $GFI = 0.93$ ,  $RMSEA = 0.05$ ) fits the data best, providing evidence of divergent validity.

In other words, similarity, activities, trust, cohesion, job satisfaction, and team performance are six discernible constructs at the individual level of measurement.

*Descriptive analysis*

Prior to hypothesis testing, bi-variable correlations were computed and results are shown in Table I. Both similarity and activities positively correlated with trust and cohesion. Both trust and cohesion positively correlated with job satisfaction and team performance. Demographic and team variables of sex, education, tenure, position, team size and team history did not correlate with the study variables in a consistent and meaningful pattern (data not shown but may be obtained from the author). For reasons of theoretical parsimony, these variables were excluded from further model estimation.

*Hypotheses testing*

Following Anderson and Gerbing’s (1988) procedure for analyzing structural models, three sets of competing models were fitted to the data to test our research hypotheses (see Figure 2 for model specification). First of all, a base model (Direct Model) was specified, shown as dotted arrows in Figure 2. This model estimates therefore the coefficients between antecedents and consequences (direct effects), without decomposing the variance into mediating paths through trust and cohesion. Second, this direct model was compared with two more complex models that were nearest in likelihood to the hypothesized structural model:

The Partial Mediation Model is identical to the Direct Model but also includes mediational paths, shown as the combination of solid and dotted arrows in Figure 2. This model estimates the coefficients between antecedents and consequences, while decomposing the variance into mediating paths through trust and cohesion (direct and indirect effects).

The Full Mediation Model is identical to the Partial Mediation Model but excludes all paths in the Direct Model, shown as solid arrows in Figure 2. This model estimates the coefficients between antecedents and consequences decomposing the entire variance into mediating paths through trust and cohesion (indirect effects only).

Table II displays the overall fit indices of the competing models. When using SEM, a major component of the analysis involves evaluating how the hypothesized model fits the observed data. Considerable debate exists regarding which fit indices are appropriate and there is still no golden-standard. Nonetheless, researchers have warned that some commonly used fit indices, such as GFI and NFI were substantially affected by factors extrinsic to actual model misspecification (e.g. sample size and number of indicators per factor) and did not generalize well across samples (Anderson and Gerbing, 1984; Hu and Bentler, 1998; Marsh *et al.*, 1988). Some SEM experts have

	Mean	SD	1	2	3	4	5	6
1. Psychological similarity	13.43	2.48	1					
2. Shared social activities	29.53	7.96	0.38***	1				
3. Team trust	33.80	5.11	0.27***	0.20***	1			
4. Team cohesion	25.98	3.87	0.45***	0.46***	0.61***	1		
5. Job satisfaction	13.70	2.82	0.23***	0.08	0.53***	0.41***	1	
6. Team performance	18.97	3.33	0.35***	0.20***	0.53***	0.60***	0.48***	1

Notes:  $n = 388$ . \*\*\* $p < 0.001$

**Table I.**  
Interrrelations  
among main  
research variables

**Table II.**  
Model fit summary  
and structural  
models comparison

	$\chi^2$	df	$\chi^2/df$	GFI	CFI	RMSEA	Comparison	$\Delta\chi^2$	$\Delta df$
1. Partial Mediation Model (Model A)	1,528.92	548	2.79	0.76	0.82	0.09	A vs A1	210.65***	1
2. Partial Mediation Model-Modified (Model A1)	1,318.27	547	2.41	0.82	0.90	0.07	B vs A1	150.23***	3
3. Full Mediation Model (Model B)	1,468.50	550	2.67	0.78	0.88	0.08	B vs B1	288.15***	1
4. Full Mediation Model-Modified (Model B1)	1,180.35	549	2.15	0.85	0.93	0.05	B1 vs A1	137.92***	2
5. Direct model (Model C)	2,224.79	556	4.00	0.67	0.75	0.17	C vs B1	1,044.44***	7

**Notes:**  $n = 388$ .  $\Delta\chi^2$ ,  $\chi^2$  difference. \*\*\* $p < 0.000$

recommended against the use of the GFI, AGFI,  $\chi^2/df$  ratio, and NFI, while supporting the use of the CFI and RMSEA (e.g. Hu and Bentler, 1998, 1999; Steiger, 2000). As noted by Martens (2005), the research underlying these recommendations is some of the most comprehensive on the topic. Thus, these recommendations were followed in this study.

As shown in Table II, results of Model A and Model B are less than desirable (CFI  $< 0.90$ , RMSEA  $> 0.08$ ). I therefore modified both models by allowing the error terms of trust and cohesion to correlate (shown in Figure 2). This is because theoretically trust and cohesion may be indicators of a higher-order factor, namely positive team dynamism (also see Table I). The modified full mediation model (B1) produced a significantly better fit to the data compared to Model B, Model A1 and Model C. The value of CFI for Model B1 was greater than 0.90 and the value of RMSEA was below 0.08, both within the recommended range of an acceptable fit (Hu and Bentler, 1998, 1999; Steiger, 2000). Therefore, in keeping with the principle of parsimony, I concluded that Model B1 provided the best fit to the data.

## Discussion

In today's business world, many companies have already adopted team-based work structures to build and maintain competitiveness of organizations (Gino *et al.*, 2010; Pearce and Ensley, 2004). Virtual teams as a special case of work team arrangement, cashing on the recent advances in technology such as cloud computing, offer the management a high expectation to further enhance organizational competitiveness. However, this new form of work team is yet to deliver its promise, as shown in studies comparing virtual teams against traditional face-to-face teams. The major hurdles seem to be the lack of trust, prevalent miscommunication, low group cohesion, low member satisfaction, and worse task performance (Baltes *et al.*, 2002; Furumo *et al.*, 2009; Martins *et al.*, 2004; Powell *et al.*, 2004). Although prior research has shown that for conventional work teams, trust (Costa, 2003; Erdem and Ozen, 2003; Simons and Peterson, 2000; Webber, 2008) and cohesion (Chang and Bordia, 2001; Evans and Dion, 1991; Spector, 2006) are positively related to team performance, little is known about the effective ways of fostering trust and cohesion in virtual teams which do not meet regularly if at all. Within the context of the classic input-process-outcome (IPO) framework (Marks *et al.*, 2001), we need to delineate the "mediating processes that explain why certain inputs affect team effectiveness and viability" (Ilgen *et al.*, 2005, p. 519).

Although the IPO framework has been used to organize research findings on virtual teams, existing studies rarely encompass different areas of the entire process (Powell *et al.*, 2004). As such, I borrowed interpersonal relationship development as a metaphor for unraveling the psychosocial interactions among virtual team members throughout the flow of IPO. Specifically, I proposed that social cognitive features such as perceived similarity and shared social activities with team members foster opportunities to develop interpersonal trust and group cohesion, which in turn contribute to member satisfaction and team performance. This process is in accordance with the above mentioned literature that treats trust and cohesion as antecedents of a high level team performance, as well as results of individual-level psychosocial interactions among team members. As the full mediation model (Model B1 in Table II and also Figure 2) received the strongest support in our study, the developmental process linking psychosocial features of team members with work outcomes, through the dual-mechanism of trust and cohesion as mediators seems to be a fair representation of the dynamism in the virtual team context.

#### *The dual-path to a successful work team*

One thrust of this study is that I modeled the work team development processes after the well-established developmental sequence of interpersonal relationships, bridging the research of work teams with social psychological theories and empirical evidence. After all, work teams are composed of individuals, thus it makes sense to “unpack” the group-level phenomena such as trust and cohesion at the individual-level to unravel the mystery of group dynamism (cf. Bond, 2002). This may be especially true in the virtual team context, as “strangers” are forced to work interdependently without actually being together. Both the temporal and spatial gaps disrupt the natural flow of human interactions, possibly making the “filters” in relationship formation and development even more critical factors for team success. In other words, the process model depicted in Figure 2 is a generic development model which may be applied to collocated and non-collocated work teams. Virtual teams though, are a potent special case, which amplify the developmental functioning of key mechanisms.

Applying the social psychological model of relationship development (Figure 1) to the work team context, I have identified and confirmed that team composition in terms of deep-level member similarity, and team activities other than work tasks are two antecedents to the perception of team trust and cohesion. In a metaphoric sense, deep-level similarity and pleasant social interactions among members, even in a tuned-down form of on-line communications and sharing, are conducive to a positive team climate and may help to break down social barriers between strangers. Trust is inherently a cognitive judgment of another party’s motives and intentions (Robinson, 1996; Simons and Peterson, 2000). In other words, trust is cognitively established, in that one builds probabilistic beliefs about another’s future actions based on rational reasons, such as past behaviors of, or prior experiences with that other party (Lewis and Weigert, 1985; Good, 1988). With the scarcity of prior interactive experiences among virtual team members, the perceived deep-level similarity may serve as a reference framework to ensure trust. Contrast to the surface-level similarity which mainly pertains to demographic characteristics, the deep-level similarity as operationalized in this study, encompasses value homophily (Lazarsfeld and Merton, 1954). That is, people perceive a high level of psychological similarity in terms of values, attitudes, and beliefs with their team members. They can then use themselves as the anchoring point to rationally deduce the motives and intentions of their team members. Both the predictability of

others' actions and the consistency of those actions with one's own value system ensure the basis of trust towards team members. Our finding that deep-level similarity breeds trust for team members is consistent with previous findings that deep-level diversity impacted group functioning more than surface-level diversity (Harrison *et al.*, 2002), and that deep-level similarity between supervisors and subordinates enhanced positive feelings towards supervisors (Chou *et al.*, 2005).

Another condition leading to trust is belief in benevolence, whereby the trustee is believed to want to do good to the trustor because of the specific attachment they share (Mayer *et al.*, 1995). People do not normally get to choose the work teams to join, thus extra-work activities, especially those pleasant social activities may provide opportunities to strengthen the relational bonds between the parties and affirm the implicit assumption that other's in one's social relationships have respect and concern for one's welfare (Lewis and Weigert, 1985). Our finding that shared activities breed trust for team members is consistent with previous findings that frequent interactions among team members helped relationship building and social integration (Jarvenpaa and Leidner, 1999; Webber, 2008), and that activities enhanced high-quality exchange between members and the team (Tse and Dasborough, 2008).

Through the same mechanisms, similarity and activities are also conducive to the perception of team cohesion. Deep-level value homophily facilitates generic and organizational social identification (Hogg, 2006; Hogg and Terry, 2000), as well as team identification (Wu and Lu, 2014). Group identification enhances team members' group pride, which in turn prompts team cohesion that reflects the shared pride of team (Wei and Wu, 2013). Shared activities along with their positive psychosocial rewards and friendship opportunities may enhance the willingness to stay in the team, which is a pivotal feature of group cohesion (Balkwell, 1994; Spector, 2006).

Finally, our test of the integrative mediation model provides solid evidence that the perception of team trust and cohesion jointly and fully mediate the relationships between psychosocial factors of members and their satisfaction as well as team performance. In line with expectations, results in this study clearly demonstrated that when team members exhibited deep-level similarity and frequent social sharing, such non-work aspects of the team dynamism prompted the perception of trust and team cohesion, thereby increasing both member satisfaction and team performance. I further address a research gap in the work team literature by establishing the model in a novel yet emerging context (virtual teams) that constrains the effectiveness of member interactions (Baltes *et al.*, 2002). Additionally, the present study affirmed the generalizability of team trust and cohesion within the Chinese work context while most extant studies have collected data from western samples (e.g. Baltes *et al.*, 2002; Evans and Dion, 1991; Powell *et al.*, 2004; Simons and Peterson, 2000; Spector, 2006).

#### *Strengths, limitations and future directions*

The theoretical strength of this study is that by drawing a metaphoric parallel between the formation of interpersonal relationships and the evolving dynamism of work teams, the rich social psychological literature can be used to build a solid theoretical basis for advancing research on work teams in general and virtual teams in particular. Bridging social psychology with management research will generate fresh insights for the explanation of some group-level phenomena (Hogg and Terry, 2000). The individual-level analysis is also appropriate for tackling organizational behavioral issues in virtual organizations (Sparrow and Daniels, 1999).

The methodological strength of this study is that data were collected at three different time points, which reduces potential biases that may result from common method variances (Podsakoff *et al.*, 2003). Furthermore, only a study design with a built-in temporal structure can provide the appropriate data to support a developmental model as depicted in Figure 2. Second, the present study offers valuable insights into how various plausible models compare to one another through conceptualizing and testing different integrative mediation models (direct effects and/or indirect effects).

This study has several limitations that point to avenues for future research. First, the current sample was set in a single Chinese society (Taiwan) so as to provide the advantage of controlling for potential societal-level confounding variables, but this limits the generalizability of the results. Accordingly, a valuable extension of this research could be testing the generic developmental model in another Chinese society (e.g. the mainland China) and conventional face-to-face teams. Second, although team dynamism can be analyzed at multiple levels, I examined it at the individual-level to correspond the level of social psychological theorizing. The constructs were all measured at the individual-level to legitimize the level of analysis, but it may be worthwhile to examine certain team-level or organizational-level constructs such as formal team structure and firm practices, to establish the boundary conditions of our model in future research. Finally, our measure of team performance asked team members to provide overall perceptions of this attribute. To further the understanding of team building effects, it would have been beneficial to have both perceptive and objective team performance indicators.

To conclude, our study has answered scholars' calls that trust needs to be established among members in virtual teams (Powell *et al.*, 2004; Wilson *et al.*, 2006), and that the team needs to stick together to continue to work for a common goal (Jarvenpaa and Leidner, 1999; Malhotra *et al.*, 2007). I have shown that for trust and cohesion to happen in virtual teams, psychosocial aspects of the team dynamism need to be carefully nurtured, which then will eventually lead to successes for both the individual members and the team as a whole.

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