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Perceived Faultline in Virtual Teams: The Impact of Norms of Technology Use

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PERCEIVED FAULTLINE IN VIRTUAL TEAMS: THE IMPACT OF NORMS OF TECHNOLOGY USE

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Abstract

As virtual teams are naturally distributed and diverse, they are susceptible to faultline, causing teams fracturing into subgroups. The current works examining perceived faultline have mostly concentrated on collocated teams. Examining these phenomena in virtual teams deserves more attention due to the greater possibility of members making an inaccurate impression from the limited cues available. To address this need, this research presents a novel study among 200 virtual team members from various industries. The empirical findings suggested that perceived faultline negatively impact team performance through task conflict. This negative effect of task conflict however can be attenuated by norms of technology use. This emphasize the need for cultivating or deliberate creation of norms of technology use among distributed team members in helping them coping with the negative effect resulted from faultline and conflict.

Keywords: Virtual teams, faultline, conflict, norms of technology use

1. INTRODUCTION

Traditionally, teams used to have collocated members but the proliferation of information communication technologies has enabled disperse team members to collaborate (Carmel 1999). The new trends of conducting business and structuring organization have also shaped the continual growth of dispersed teams that collaborate via technologies. As a consequence of the globalization, companies are likely to be involved in alliances, joint ventures and partnerships that require them to establish cross boundary teams. Virtual teams have been considered effective in integrating resources for responding to the global competitions (Cascio 2000). Despite its attractiveness, virtual teams are challenging to manage due to the complexities of diverse team compositions. One of the disruptions arising from diversity is the emergence of subgroups within a team (Lau & Murnighan 1998).

Subgroups or dormant faultline can emerge naturally within virtual teams based on alignment of shared attributes (e.g. demographic, location, culture). For example, one could find a subgroup of junior Asian system developers and a subgroup of senior European system analysts within a virtual software engineering team. According to faultline theory, this dormant faultline can be activated through any events or policies hence invoking a sense of division (perceived faultline) among the team members (Lau & Murnighan 1998). This activated perceived faultline can negatively impact team processes such as team learning (Jehn & Rupert 2008) and team functioning (Molleman 2005) and consequently impact team performance. Given the possible detrimental impact of perceived faultline it will be useful to understand the mechanism of faultline impacting virtual team performance.

The current works examining perceived faultline have been largely founded on collocated teams, which differ from virtual teams in terms of their primary mechanism of interactions (face-to-face vs. computer-mediated) and range of dispersions among team members (collocated vs. distributed). Addressing this gap is particularly crucial, since the process of impression formation and categorization of team members is arguably different in collocated and virtual settings. In a traditional collocated team setting, team members can use multiple cues during face-to-face interactions to gauge how similar or different their team members are from them. These attributes are used to self-categorize themselves into a similar in-group and distinct themselves from the out-group (Turner 1985). Examining these phenomena among virtual teams members deserves more attention due to the greater possibility of members making an inaccurate impression towards their team mates due to the limited cues available from online interactions (Hancock & Dunham 2001; Walther 1997). Of the limited studies that exist, the studies have been conducted in experimental setting using student teams as surrogates. While these studies have been insightful, we are still lack of understanding how this perceived faultline will likely impact the virtual teams in working industries.

Hence, this study presents an exploratory study among virtual team members in the industries. This study proposes a research model which describes the mechanism of perceived faultline impacting perceived team performance through the presence of intra-group (relationship and task) conflict. Additionally, this model postulates norms of technology use as moderating the detrimental effect of conflict towards perceived team performance.

2. RESEARCH MODEL AND HYPHOTHESES

The proposed model is grounded on Faultline Theory and literature in conflicts and computer supported cooperative work. We propose that perceived faultline exert negative impact on team performance through the presence of tasks and relationship conflicts. This detrimental impact on perceived faultline however, can be moderated by norms of technology use of distributed team members.

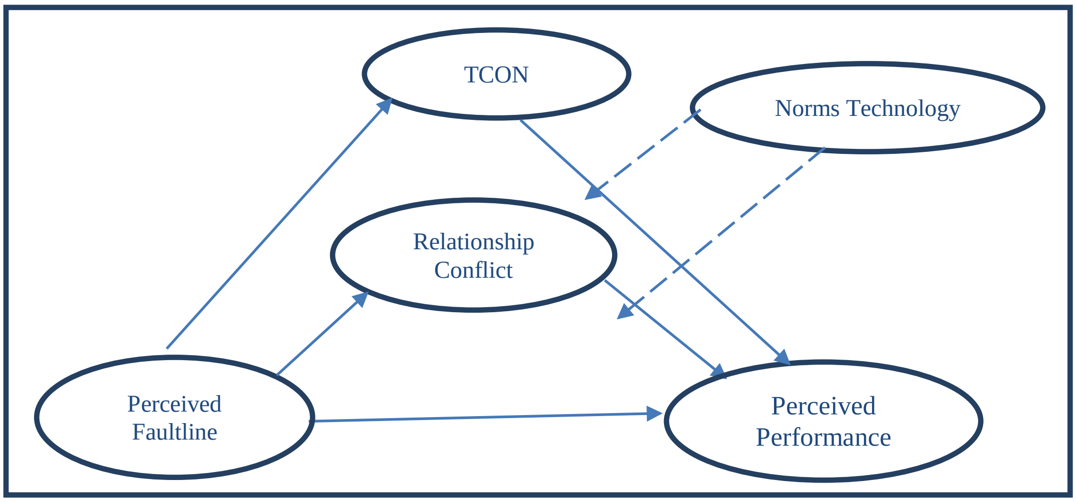

Figure 1. Perceived Faultline Impact on Team Performance

2.1 Perceived Faultline and Perceived Team Performance

In the current faultline studies, the initial findings remain contradictory. Some studies found that faultline improve team processes and performance (Gibson & Vermeulen 2003; Lau & Murnighan 2005) while others have discovered the opposite (Hart & Van Vugt 2006; Li & Hambrick 2005). These contradictory discoveries have been associated with, among others, the way faultline was conceptualized and investigated in the current studies. In particular, these researches have focused on dormant faultline which may not be invoked and not causing a division in the team (Lau & Murnighan 1998; Shen et al. 2008). By only calculating the assumed faultline based on members' attributes, the researchers may neglect the subjective feelings of team members. In reality, the researchers have not answered the question as to whether the faultline are actually perceived by team members. Hence, recent studies have advocated the need to examine perceived faultline or active faultline.

Perceived faultline as adapted from Jehn and Bezrukova (2010), occurs when members actually perceive the divisions and the group behaviorally splits into subgroups based on alignment of attributes (demographic or non-demographic). This strong sense of divisions has been associated with several negative behaviors which negatively influence perceived team performance. Among the associated problems are misattribution (Cramton et al. 2007), unfavorable perceptions (Huang & Ocker 2006) and conflicts (Greer & Jehn 2007) between subgroups. These conflicts need to be resolved hence consuming time and effort which should be directed to performing tasks effectively. This resulted in lower perceived team performance. Hence the following hypothesis is developed:

H1: Perceived faultline is negatively correlated with perceived team performance

2.2 Mediating role of conflicts

Although, perceived faultline will likely impact team performance, the impact will be most likely occur indirectly through influencing the interpersonal dynamics among members (van Knippenberg et al. 2004). When strong faultline is perceived by team members, negative processes such as conflict are prone to occur as the two sides become more suspicious and prejudice of one another (Kankanhalli et al. 2007; Li & Hambrick 2005). As faultline becomes more salient, team members tend to have ingroup-outgroup demarcations, eventually increases the likelihood of subgroups experiencing discomfort, hostility, and anxiety (Polzer et al. 2006).

This intragroup conflict can be either centered on task-related issues (task conflict) or interpersonal issues (relationship conflict). Specifically, task conflict refers to the disagreements over work-related issues. Unlike relationship conflict, task conflict has been linked with positive impact to team performance as it increases divergent perspectives and assessments of alternatives.

This arguably enhances creativity and decision making, thereby increasing group performance (Jehn 1995). However, more studies are showing evidence on the detrimental effect of conflict towards team performance. For example, a meta-analytic review by De Dreu & Weingart (2003), have showed that both task and relationship conflicts impair team performance. Task conflict increases the cognitive load and disrupts the thinking and information processing process. It may slow down the decision making as more time and resources involve in coordination and conciliation which detracts the team performance (Choi & Kim 1999). Additionally, task conflict benefit can only be gained through effective information sharing and extensive evaluation of alternative solutions. Yet, this process is challenging for distributed teams because of the scarce opportunity to meet simultaneously due to different time zones, varying temporal rhythms and the limitation of mediating technologies (Hinds & Bailey 2003). Distributed teams also are more susceptible to misunderstandings and task conflict due to challenges in communicating contextual information, non-uniform distribution of information and inaccurate interpretation of silence between communications (Cramton 2001).

Meanwhile, relationship conflict stemmed from differences in interpersonal styles, preferences and personality (Jehn 1999). These disagreements rooted from contrasting values and preferences, and increased anxiety as values are essential component of self-concept. Hence, differences in values lead to an ego threat and provoke dysfunctional attitudes (such as antagonism) that complicate the process of managing conflicts (de Dreu & Knippenberg 2005). Relationship conflict may further lead to detrimental social exchange and reduce the level of organizational citizenship behavior that facilitates the maintenance and enhancement of the social and psychological context of the group that supports its task performance (Choi & Sy 2010). It impairs team performance because the time and resources could be more effectively spent on task accomplishment rather than in reconciling non task related issues (Evan 1965). In distributed teams, the technology mediated interaction can increase the probability of making attribution error toward the other subgroups due to limited social cues available to help interpret the interactions. Hence, it can be argued that perceived faultline will significantly affect team performance when they interfere with interpersonal processes such as task and relationship conflict. Following this discussion, it can be hypothesized that:

H2: Both relationship conflict and task conflict mediate the relationship between perceived faultline and perceived team performance

2.3 Moderating role of Norms of Technology Use

Distributed teams rely heavily on collaborative technology to support their interaction and tasks. However, by merely having collaborative technology does not necessarily guarantee effective collaboration between team members. To gain the benefit of collaborative technology, team members have to be flexible in adapting their norms and team structure (Susman et al. 2003). Coordination in distributed teams has much to do with the way norms for media usage are established and enacted. Norms are expected patterns of behavior that reflect ways of acting that have been accepted as legitimate by members of a group (Hare 1976). In distributed teams, norms permit actors to engage in socially coherent behavior, helping them to structure their activities in ways that are consistent with other team members' expectations, and to avoid conflicts.In this study, norms of technology use, is defined as shared patterns of ICT use that teams adopt to regulate and regularize member's interaction and collaboration. In early phases of virtual teams, team members often struggle in collaboration because they lacked a common set of procedures or way of doing things. They may have different practices and understanding of expected behavior of the team from their previous work contexts. Their expectations differ as to how the team's work should be done on the project, which creates conflict and tension (Bjørn & Ngwenyama 2009). Each team member tends to interact and perform a task in her/his own way; hence, they do not adequately share information with other team members.

Conflict between subgroups sometimes resulted from the limited awareness of the tasks performed by other subgroups. Group awareness information includes knowledge about who is on the project, where in the code they are working, what they are doing, and what their plans are.

Awareness information about team members and their tasks enable team members to have shared context, an aspect deemed critical in reducing conflict in distributed teams (Hinds & Mortensen 2005). Hence, the adoption of a common technology for updating and decision making tasks can increase awareness information about the tasks and the people and develop shared understanding between team members. This helps reducing blaming and task conflicts which eventually improve team performance. When the level of conflict is under controlled, team members can invest more time in productive tasks and hence, improve the team performance.

Subgroups also experience conflict due to inaccurate attribution resulted from the inability to reach team members (Diamant et al. 2008). This situation is partly caused by the minimum overlapping time zone that allows synchronous communication to happen (Hinds & Mortensen 2005). Malhotra and Majchrzak (2009), further argued that diverse team performs better when they use technology to engender virtual co presence. This can be achieved when all team members are aware of the whereabouts and availability of the team members, and avoid misattribution for not responding in a timely manner. A crucial element of interaction in distributed teams is the opportunity to have informal, spontaneous communication among team members. Communicating using synchronous technology like instant messaging is important to reduce the differences among subgroups in a dispersed team (Ocker et al. 2010). Interaction through instant messaging also increases opportunities to share information, including information about one's own interests. This is a crucial element in fostering personal relationship and collaborative conflict resolution among culturally diverse virtual team members (Hinds & Mortensen 2005).

In summary, through the adoption of norms around technology use, knowledge about tasks progress and the people working around the tasks are improved. Additionally, mutual understanding between distributed team members can be increased and teams can perform effectively with reduced levels of conflicts. Following this, the last hypothesis was formulated

H3a: Norms of technology moderates the impact of task conflict on team performance
H3b: Norms of technology moderates the impact of relationship conflict on team performance

3. RESEARCH METHODOLOGY

3.2 Subjects and Tasks

Data was collected through an online survey from individuals who are working in virtual teams. An online survey was deemed as the most appropriate and unobtrusive way of reaching the virtual team members as they were scattered in various geographical locations and they mostly spend their times communicating using technologies. Snowball sampling method was used in which invitation email containing the survey link was sent to all related contacts in the researcher's social network. These identified potential respondents were asked to forward the email invitations to their social network. Participation was voluntary and no monetary rewards were given. In total, there were 230 respondents participated in the survey. After filtering the survey for missing data only 200 surveys were included for analysis.

3.3 Constructs Operationalization

Most constructs are from established literature. Perceived faultline *(PFAU)* is measured using 7-point Likert scale with five items (Shen et al., 2008). Both Perceived task conflict *(TCON)* and relationship conflict *(RCON)* are measured using 5-point Likert scale (Rink & Jehn 2006). Perceived team performance *(PFOM)* is represented by 4 items measured by 7-point Likert scale (Henderson & Lee, 1992). Norms of Technology Use *(TECHNORMS)* is a newly developed construct based on established literature. It contains two components; technology norms for communication (TCM) and technology norms for tasks (TSD).The former components has 2 items and the latter has 3 items. Both components were measured using 5 points with 1 *(Not at all*) to 5 *(Very much).*

3.4 Demographic Data

In total data from 200 participants was used for the analysis. Of the total, 55 percent were female and 45 percent were male. In terms of age distribution, 45 percent of them were between 30-34 years old, 27 percent between the age of 35-39, 15 percent from the age of 25-29 and the rest were above 40. In terms of experience working in distributed teams, 33% have worked more than 5 times, 19% have experienced 4-5 times, 34% have 2-3 times experienced working and the remaining have at least worked once in distributed teams. In conclusion the sample represents the kind of individuals who have worked in distributed teams and possess the experience to be shared.

4. RESULTS AND ANALYSIS

The model was analyzed using SmartPLS (Ringle et al. 2005) since the model involves multiple independent and dependent variables. The analysis procedures involved two stages; evaluation of the measurement model and evaluation of the structural model (hypothesis testing). The following section delineates the result of each stage.

4.1 Validation Results of Measurement Model

Table 1 below demonstrates all indicators significantly loaded on their respective constructs, hence demonstrating reliability.

Construct	Indicators	Loading	weight	T Statistics
RCON	CR1	0.912	0.605	23.650
	CR2	0.773	0.254	10.586
	CR3	0.802	0.296	10.388
TCON	CT1	0.916	0.316	73.071
	CT2	0.936	0.269	90.980
	CT3	0.936	0.271	94.945
	CT4	0.881	0.233	50.716
TCM	TCM1	0.900	0.501	46.498
	TCM2	0.930	0.588	107.441
TSTD	TSD1	0.933	0.379	85.055
	TSD2	0.930	0.405	141.484
	TSD3	0.823	0.328	22.619
PFOM	PF1	0.923	0.297	70.805
	PF2	0.857	0.221	36.594
	PF4	0.948	0.306	115.420
	PF5	0.926	0.266	117.954
PFAU	SG1	0.759	0.157	9.004
	SG2	0.823	0.255	12.739
	SG3	0.806	0.300	15.024
	SG4	0.828	0.507	19.910

Table 1. Item loadings

Additionally, Table 2 displays the composite reliability and the average variance extracted (AVE) for all for all measures exceeded the recommended threshold of 0.7 and 0.5 respectively (Fornell & Larcker 1981). Hence, the construct demonstrates construct validity.

Construct	AVE	Composite Reliability
PFAU	0.6591	0.8854
RCON	0.7027	0.8759
TCM	0.8415	0.9139
TSD	0.8042	0.9247
TCON	0.8434	0.9556
PFOM	0.837	0.9535

Table 2. Composite Reliability and Average Variance Extracted

Table 3 below demonstrates all the constructs satisfy the first requirements for discriminate validity; the loadings of items on their respective constructs were higher than cross-loadings of the items on the other constructs (Chin 1998).

	RCON	TCON	TCM	TSTD	PFOM	PFAU
CR1	**0.916**	0.615	-0.255	-0.299	-0.192	0.354
CR2	**0.781**	0.365	0.029	-0.092	-0.007	0.168
CR3	**0.812**	0.314	0.066	-0.108	0.089	0.226
CT1	0.564	**0.917**	-0.432	-0.446	-0.387	0.378
CT2	0.524	**0.937**	-0.420	-0.460	-0.357	0.296
CT3	0.428	**0.937**	-0.490	-0.439	-0.356	0.301
CT4	0.546	**0.882**	-0.380	-0.378	-0.274	0.290
TCM1	-0.094	-0.400	**0.904**	0.543	0.426	-0.204
TCM2	-0.138	-0.460	**0.931**	0.719	0.564	-0.175
TSD1	-0.246	-0.408	0.604	**0.932**	0.459	-0.249
TSD2	-0.214	-0.565	0.746	**0.929**	0.600	-0.296
TSD3	-0.178	-0.268	0.500	**0.825**	0.405	-0.220
PF1	-0.025	-0.355	0.552	0.522	**0.924**	-0.145
PF2	0.009	-0.263	0.403	0.390	**0.859**	-0.186
PF3	-0.162	-0.425	0.547	0.567	**0.948**	-0.133
PF4	-0.138	-0.319	0.469	0.510	**0.926**	-0.093
SG1	0.132	0.127	-0.083	-0.145	-0.053	**0.775**
SG2	0.217	0.198	-0.020	-0.146	-0.059	**0.833**
SG3	0.247	0.208	-0.164	-0.288	-0.117	**0.813**
SG4	0.349	0.425	-0.274	-0.276	-0.181	**0.825**

Table 3. Cross loading output

The following Table 4 shows the square roots of AVE ranged are all greater than 0.9, satisfying the second requirements of discriminate validity (Chin 1998).

	PFAU	RCON	TCOM	TSD	TCON	PFOM
PFAU	**0.812**					
RCON	0.327	**0.838**				
TCOM	-0.205	-0.128	**0.917**			
TSD	-0.286	-0.238	0.695	**0.897**		
TCON	0.348	0.562	-0.47	-0.471	**0.918**	
PFOM	-0.15	-0.092	0.545	0.55	-0.378	**0.915**

Table 4. Square roots of AVE (bolded diagonal)

For the second order construct (TECHNORMS), initially the first order reflective constructs were inspected. Table 5 shows that all the first order constructs (TCM,TSD) demonstrate adequate reliability; composite reliability and AVE exceeded the recommended threshold of 0.7 and 0.5 respectively (Fornell & Larcker 1981).

First Order	Indicators	Loading	AVE	Composite Reliability
TCM	TCM1	0.9	0.8415	0.9139
	TCM2	0.93		
TSD	TSD1	0.933	0.8042	0.9247
	TSD2	0.93		
	TSD3	0.823		

Table 5. First Order Construct (reflective) Validity

Following this, the weight loadings were examined to assess the relative make-up of each items. Table 6 shows TCOM and TSTD**,** each has significant weight. The variance inflation factor (VIF) value of 1.00 for first-order factors (TCOM and TSTD) linked to the second-order construct (TECHNORMS). This is far below the common cut-off threshold of 5 to 10 (Kleinbaum et al. 1998).

Second Order	First Order	VIF	Weight
TECHNORMS	TCM	1	0.43
	TSD	1	0.65

Table 6. Second order construct validity (formative)

In conclusion, all the constructs demonstrated appropriate validity. Next, the structural path or the hypotheses were tested.

4.2 Validation Results Structural Model

4.2.1 Assessment of Direct effect

The direct effect of perceived faultline on team performance was tested with the bootstrapping technique considering n = 500 resamples. A significant negative relationship of perceived faultline and team performance ($\beta = -.111$, $p < .05$). Hence H1 was supported.

4.2.2 Assessment of Mediating Effect

In a second step, both mediators were tested simultaneously (Preacher and Hayes, 2008). When task and relationship conflict were entered together, both proved to be significant mediators. The paths from IV (Perceived Faultline) to Mediators (Task Conflict and Relationship Conflict) were both significant with standardized path coefficient $\beta = 0.288$ and $\beta = 0.265$ ($p <0.05$) respectively. Consequently, both paths from the Mediators (Task Conflict and Relationship Conflict) to DV (Team Performance) were significant with standardized path coefficient $\beta= - 0.460$ and $\beta= 0.201$ ($p< 0.05$) respectively. Next the significance of the mediating effect was assessed by calculating Sobel test**.** The test indicated both relationship and task conflict were significant mediators (Z= -3.95, 2.15, $p < 0.05$) Hence, there exists a significant indirect effect of perceived faultline on team performance exerted through task and relationship conflict, supporting H2.

4.2.3 Assessment of Moderating Effect

A two-stage PLS approach was used for estimating the moderating effect (Henseler & Fassott 2010).Bootstrapping procedure was run with 500 samples to obtain the significance of the interaction/moderating effect (Henseler & Fassott, 2010). There was a significant interaction effect for Norms of Technology x Task Conflict ($\beta = 0.108$, $p < .05$) supporting H3a. The effect size was 0.25 and can be interpreted as moderate effect (Cohen 1988). However, the interaction effect for Norms of Technology x Relationship Conflict was not significant ($\beta = -0.050$, $p > .05$) disconfirming hypothesis H3b.The interaction graph (Aiken & West 1991) was plotted showing interaction effect between task conflict, norms of technology use and task conflict (refer to Figure

2). When norms of technology is high, the negative effect of task conflict towards team performance was lesser.

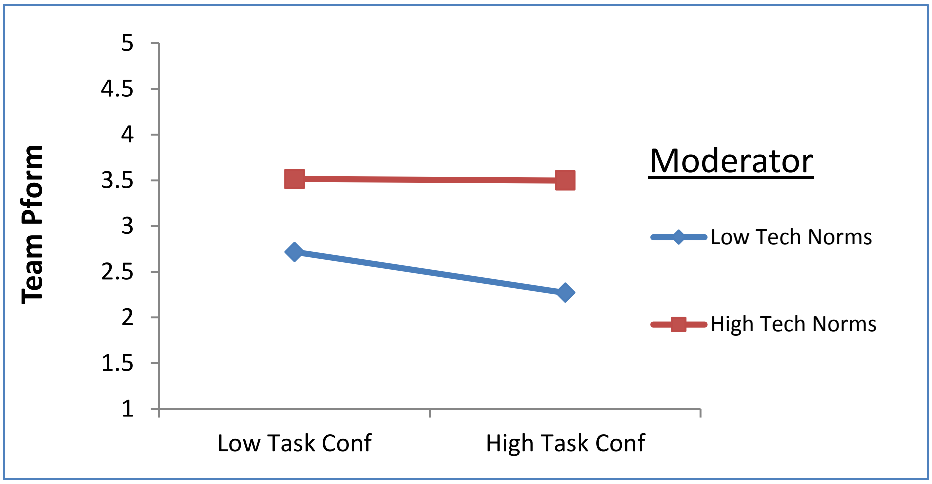

Figure 2. Interaction effect between task conflict and norms of technology use

Figure 3 depicts the path coefficients and the significance of the constructs in the research model.

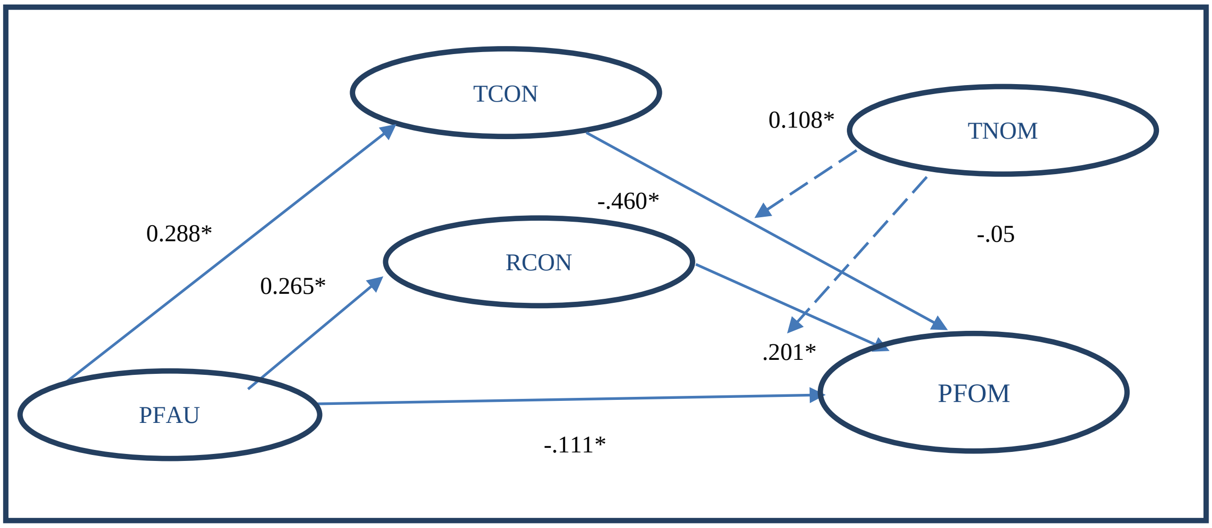

Figure 3. Validated Research Model (indicate significant path coefficient)*

5. DISCUSSION

This exploratory suggested that perceived faultline impact the perceived team performance among virtual team members. This perceived faultline had positive correlation with task conflict which consequently has negative relationship with team performance. In distributed teams, reduced distance proximity will likely reduce homogeneity and increase demographic and task related diversity among team members (Hinds & Bailey 2003). The strong sense of faultline perceived by team members further exacerbated the task conflicts. Strong sense of faultline means team members tend to identify themselves to subgroups with similar attributes and disassociate themselves from members perceived as different. These separations can disrupt the process of negotiations for solutions hence increase the level of task conflict. Valuable resources which should have been spent on performing the tasks are being redirected to solve the conflicts, consequently lead to the negative perception of team performance.

Meanwhile the mediating role of relationship conflict between perceived faultline and team performance was quite perplexing. The perceived faultline positively influence relationship conflict. However, this conflict is positively related with team performance. It is plausible that through the manifestation of relationship conflict, team members have better chance to understand their team members and to clarify the inaccurate perceptions between them. This improve understanding may foster new healthier relationships which improves their perceived performance. This finding however, needs to be reexamined in future studies.

One intriguing finding is the research model illustrates how norms of technology use can attenuate the detrimental effect of task conflict. Thatcher and Patel (2012), in their meta-analytic review paper have raised the possibility of varying preferences of technology as a source of faultline. When team members are unable to resolve differences and comprise on the use of specific technology, conflict may arise. This study enlightens the relationships among faultline, conflict, and team process by demonstrating the importance of being explicit and by adopting a common or standard technology (TSD) especially in reporting updates or changes and in decision making. In this study, adopting a common technology significantly attenuates the task conflict's effects toward team performance. This study's finding is in parallel to the argument raised by Hinds and Mortensen (2005). They argue that allowing team members to share similar tools and work processes helps facilitate shared context, thus the likelihood of misunderstandings can be reduced, hence reducing the severity of task conflicts. When the level of conflict is under controlled, team members can invest more time in productive tasks and hence, improve the team performance.

The result of this study also demonstrates how norm of using instant messaging for spontaneous social interactions is helpful in mitigating the task conflict. This study concurs with other studies that emphasize the importance of having spontaneous communications (Hinds & Mortensen 2005). In distributed teams, conflict tends to be hidden longer compared to face-to-face settings (Griffith et al. 2003). Having an agreed upon norms for using instant messaging for spontaneous interactions increases the opportunity for casual encounters and promotes contextual information sharing (Nardi et al. 2000). Consequently, this norm helps accelerate the process of clarifying task-related issues (conflicts) and enables a constant work flow among distributed team members hence improving team performance.

Managers or team leaders should be aware of the probability of faultline emerging in team, given its detrimental impact toward team performance. To minimize the disruption of faultline and at the same time to gain the advantage of diversity in team, managers can create a portfolio describing roles and tasks of each team member prior to any project execution. Team members should fill up related surveys or tests covering dimensions such as time orientation, cognitive style, personality, and other related dimensions stored as a part of their profile. Their profiles can help managers configure the optimum team composition for a particular task/project. Following this, a system that can automatically calculate the potential of faultline rising from alignment of attributes and dimension can alert the managers to choose the appropriate configuration of team members for a particular task. This automated system may help managers make informed decision in configuring the team members and in assigning tasks. The information from this system can also help managers to configure cross cutting conditions in teams to prevent strong sense of faultline emerging in teams.

6. LMITATIONS

The finding of this study need to be interpreted with caution. This study is an exploratory study that examine the phenomena of faultline and the effect norms of technology use on perceived performance at individual level. Based on this finding, this model should be verified at team level in which every responses of a virtual team should aggregated to represent the data at a team level. Nevertheless this study contributes by highlight the important dynamic that may influence virtual team performance that should be further verified.

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