Title: Managing conflict in virtual teams: The role of communication technologies

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Abstract

Virtual team working through agile and flexible Information and Communication Technology (ICT) engenders globalization, pursuing new markets outside their domestic environment: customers, suppliers; operate partners. Virtual teams employ ICTs to function across geographical boundaries and to diminish the gaps in language competence, which may arise from cultural diversity. Two fundamental communication processes (conveyance and convergence) affect the use of media, which plays an important role to manage effective communication. Employing the nature of ICTs suggests that switching between media enhances the effective communication to manage conflict between virtual teams. This research investigates how different types of virtual teams adopt and adapt ICTs, and manage conflict in different ways. The findings suggest that different types of virtual teams utilize ICTs' characteristics and choose different media in an attempt to attenuate the negative effects of competitive behavior and to enhance team effectiveness during conflict management.

Keywords: Globalization, Virtual teams, Information Communication Technology (ICT), Conflict management styles, Geographic dispersion, Language competence

1. Introduction

Organizations of all sizes are increasingly working globally, through partnerships with their customers and suppliers across the world; and this form of working has been made possible by advances in Information and Communication Technologies (ICTs). Convergence of ICTs across the Internet has allowed organizations to work across geographical boundaries in virtual teams (VTs), leading to improvements in efficiency and productivity (Huber, 1990). Over the previous decade, researchers have investigated the benefits of VTs in business and the management through technology, which placed emphasis on the growing prevalence of VTs and performance, associated with a variety of media and a combination of media employment. Many businesses find that VTs can bridge these boundaries and provide a considerable competitive advantage incorporating new technology to work 'better, faster, cheaper, and smarter' (Lipnack & Stamps, 1997). ICTs overcome geographic boundaries, yet the feature of physical location between VTs develop different types of VTs, which may affect the use of ICTs for effective communication and team performance. Although the technical feasibility establishes links and connections among team members, team diversity creates obstacles to effective communication (Maznevski & Chudoba, 2000). However, there is a lack of understanding and examination as to how VTs manage conflicts through the use of media. This paper gives new perspective to global sourcing, knowledge-sharing and VT collaboration through agile and flexible ICTs in conflict management, suggesting the effects of globalization on international business and communication.

Wherever people interact, there is potential for conflict. Past research (Jehn, 1997) has studied conflicts among team members who coordinate activities face-to-face, instead of focusing on conflict among dispersed team members. VTs that are dispersed globally are associated with temporal dispersion and language competence relating to cultural diversity and are more likely to suffer potential conflict. When one part of communicating parties is aware of discrepancies, incompatible wishes or irreconcilable desires during communication processes, conflict is produced (Boulding, 1963). However, the structural changes and teamwork are responses by many enterprises that confront great pressures and encounter fantastic opportunities presented by the integration of ICTs. One challenge in VT is conflict and tension during the process of interaction and communication because of real or perceived differences (Wall & Callister, 1995). The trend of conflict management in organizations underlines the greater acceptance of conflict and becomes the concerns over its management (Kozan, 1997). Conflict in teams might escalate and lead to incompatible results, or conflict can be beneficially resolved and lead to team effectiveness. Therefore, learning to manage

conflict is integral to a high-performance team.

Virtual teams are defined as groups of individuals who need to work together to achieve organizational goals, are geographically dispersed, and use ICTs to accomplish tasks (Townsend et al., 1998). This study reviews how VTs use five communication channels (Instant Messaging/IM, e-mail, audio, video-conferencing/VC, face-to-face meeting/F2F) and switching between them (media-switching) to reduce the escalation of team divergence, develop a form of strategic interaction and avoid a negative impact on team effectiveness through conflict management. This paper focuses on competitive behavior. The objective of the study is to look in detail at *how media are employed to manage conflict for team effectiveness*. The conceptual framework underpinning the study is shown in Fig. 1 which links together characteristics of three concepts: VTs (who), ICTs (how), and conflict management styles (what).

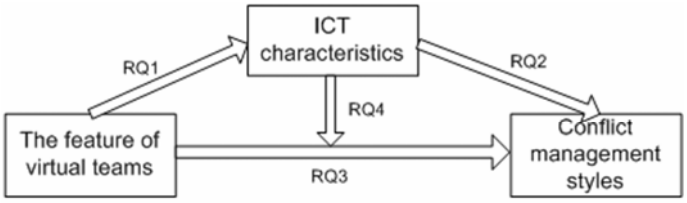

Fig. 1. The Concept of linking VT, ICT & Conflict

Fig. 1 illustrates a general model of communication transmission, which applies Shannon-Weaver's model (1947) to review the communication between source/ encoder and receiver/decoder. Also, Fig. 1 inspects the feature of VTs and conflict management, concerning with how the feature of VTs would influence media adoption, with what media would be adopted and how conflict is managed to advance the collaboration.

The research questions (RQ1 to RQ4 in Fig. 1) are stated in section 2. This paper proceeds as follows. Section 2 features the knowledge of VTs, ICTs and conflict management styles. Section 3 refers research design and methodologies, which focus on VTs based in China and Taiwan. The methodology approaches adopt questionnaire survey, in-depth interviews and IM logs. Section 4 discloses the research results and findings as to how media are employed to develop and sustain a free-flowing network in an attempt to advance the work during conflict. Section 5 concludes and offers suggestions for future research.

2. Knowledge of VTs, ICTs & conflict management styles

2.1. The features of VTs

The definitions of teams are varied by their specifics but share the concept of

complementary skills, commitment to a common purpose and the interdependence of performance goals (Katzenbach & Smith, 1992). Lipnack and Stamps (1997, pp. 6-7) define a VT as "a group of people who interact through interdependent tasks guided by common purpose" and "works across space, time and organizational boundaries with links strengthened by webs of communication technologies". Some researchers define VTs as a specific type of team which uses media to communicate but stress the characteristic of 'virtuality' to bridge the gap of their dispersed nature (e.g. Griffith, Sawyer & Neale, 2003). Some researchers specifically defined that VTs only interact through ICTs without meeting in person (e.g., Bouas & Arrow, 1996). Yet, some refinement of VT definition with regard to physical proximity suggested a transformation of VT, which includes teams meeting face-to-face when the majority of interaction occurs through ICTs (Jarvenpaa & Leidner, 1998).

The condition of geographic diversity becomes more important since organizations establish teams from various sites to perform their core work activities interdependently (Hinds & Kiesler, 2002). The geographic boundaries suggest that VTs do not share the same workplace and can be dispersed in different regions or throughout the world. Moreover, globally dispersed VTs can be affected by time-zone differences (Kayworth & Leidner, 2000). The use of ICTs could limit the effectiveness of interaction - an asynchronous or a 'real-time' interaction. The co-located VTs that are within an accessible distance can arrange F2F meetings incorporating ICTs to work interdependently on a daily basis to perform their regular and ongoing work. For globally dispersed VTs working across national boundaries and time-zone differences affect their choice of communication channels. When the choice to arrange F2F meetings is not available global VTs have to rely on remote media. Meanwhile, global teams that collaborate internationally may encounter cultural divergence in addition to individual differences, which increase the dissimilarities of shared values and expectations. These discrepant values affect the coordination in making a priority on the interdependent tasks toward a common objective. The global VTs may encounter problems with language competence and have to adopt a common foreign language. When requiring the support of knowledge, resource and expertise for an interdependent task, team members may compete with each other for task effectiveness and work efficiency.

2.2. Media richness, synchronicity and capability

Media richness is defined as 'the ability of information to change understanding within a time interval' (Daft & Lengel, 1986, p. 560). Also, media richness is also explained as the ability of a medium to carry information (Trevino, Daft & Lengel,

1990). The richness of each media is based on four criteria, which are immediate feedback, multiple cues, language variety and personal focus. The concept of media richness suggests two levels of media capacity, which are lean and rich media. Lean media (e.g. e-mail and IM) transmit data-related information. The use of lean media enables users to exchange information in an unequivocal or low equivocal task (e.g. a routine activity). Rich media (i.e. F2F, audio; VC) are capable of carrying information and delivering symbolic cues that the individuals disclose during their communication. The use of rich media enables users to reach an agreement quickly, better understand ambiguous tasks and to resolve an equivocal situation (e.g. negotiation) (Dennis & Valacich, 1999). Communicators tend to select a medium to suit the circumstances and deliver equivocal and uncertain information. The spatial, temporal and cultural virtual work arrangements between VT members lead to an increase in the complexity and confusion of communication, and this complexity affects the choice of media.

Media synchronicity theory is an extension of media richness theory to examine the ability of media capabilities (immediacy of feedback, symbol variety, parallelism, reprocessability, and rehearsability) to support the two communication processes (conveyance and convergence). Media synchronicity is the extent to which individuals use media to work together on the same activity, at the same time; i.e., to have a shared focus. Dennis & Valacich (1999) suggested that low media synchronicity in general is preferred for conveyance to transfer the messages that can be easily understood, and high synchronicity is preferred for convergence, which encourages participants to strive to agree on the meaning of information and reach a common consensus. When the medium provides immediate feedback, it affects processing time leading to faster decisions in an attempt to reduce the level of task equivocality. In this aspect, unlike traditional F2F, ICTs overcomes geographic (or potential temporal) boundaries. However, not all uncertainty tasks require rich media, which may be costly; such as lengthy conversations for simple requirement. In addition, rich media provide a great multiplicity of cues, which may lead to conflict or premature actions. IM as a lean and synchronous medium could bridge the gap of proceeding task, supplement e-mail and shorten response time; hence, making IM conversations and interactions could be easier with less hindrance by time and space. Information through symbol variety may also relate to media richness to deliver a great volume of information and affect the emotion involvement and convergence. However, Daft and Lengel (1986) stated that ICTs, unlike F2F meetings, are unable to provide rich information (verbal, nonverbal or physical cues) and relatively viewed as lean media. The sender relies on the characteristics of ‘rehearsability’ through text-based media to carefully organize content and edit a message to ensure the message is clearly expressed without extraneous or superfluous information which may be misleading.

Because of its relative novelty in the business context and its unique characteristics, IM has become a focus, which enables changes in personal accessibility, conversation sequencing, and work continuity (Zweig & Webster, 2002). IM is considered more sophisticated in its characteristic of 'presence awareness', providing useful resources to estimate the possibility of making successful contact and having interaction with the desired online recipients. 'Plausible deniability' suggests that recipients are allowed greater control over their responses, affording receivers more privacy to prioritize the communication and avoid any low priority conversations. From the 'availability checking' to 'plausible deniability', negotiating availability could be helpful for IM recipients when deciding whether they are available to talk from viewing their presence status, arrange different media for further conversation or schedule a time to conclude the discussion. Moreover, people often switch from one medium to another during a single conversation using either synchronous or asynchronous media. When the conversation content becomes complex or requires additional medium to facilitate a conversation, media-switching is a process to manage the conversations effectively.

VTs through the use of media may be more complicated than traditional team environment due to diverse factors from organizational, cultural and national backgrounds or even from language competence in global VTs (Kayworth & Leidner, 2001). The boundary-crossing collaboration may considerably influence the media application. Thus, it can be proposed (see Fig. 1):

RQ1. How would different types of VTs choose different media?

2.3. Conflict Management Styles

Conflict with teams is inevitable but the results of conflict are not predetermined. Conflict management styles have been found to be of crucial importance for the success of VTs. The dominant model for conflict management in group settings is the Dual-concern Model (Thomas & Kilmann, 1974) which identifies five styles of conflict behavior (Fig. 2), located within two dimensions of 'concern for the self' and 'concern for others'. Assertiveness and cooperativeness suggest the interrelationships in the model, which help to form the basis for the choices of conflict management strategies (Sorenson, 1999). When individuals are assertive, the tendency shows a concern for self, whereas the tendency of concern for others demands on cooperation (Wilmot & Hocker, 2001). We give a brief description of each conflict management style, but for the sake of brevity in this paper we concentrate on the competitive style.

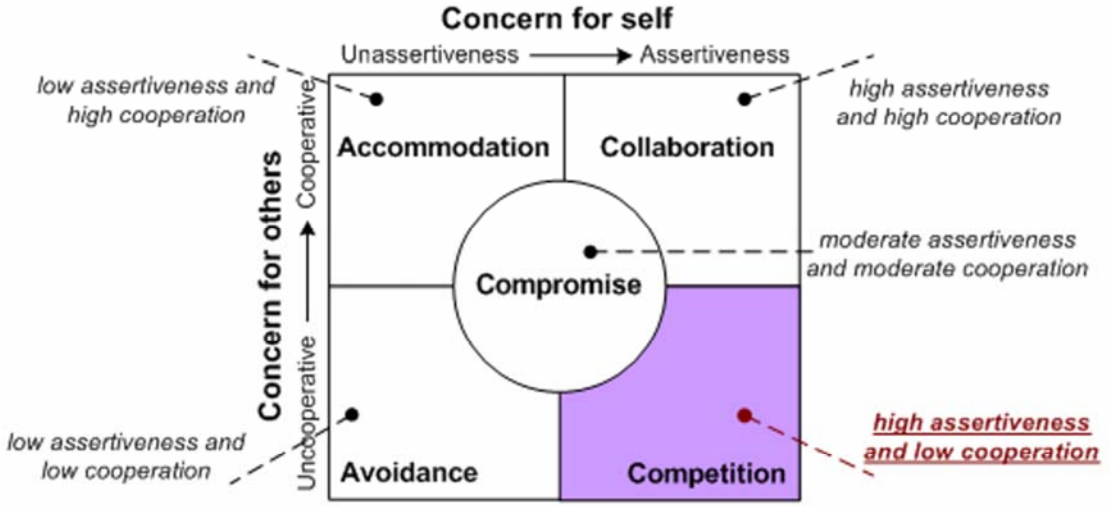

Fig. 2. Conflict management styles (Thomas & Kilmann, 1974, Wilmot and Hocker, 2001).

2.2.1. Collaboration

Collaborative behavior suggests an open-minded discussion, described as a person's intent to integrate the perspectives of all group members, having an open-minded discussion in an attempt to identify alternatives and generate solutions to reach effective mutual understanding.

2.2.1. Competition

Individuals showing competitive behavior have a tendency to emphasize their own concerns as the dominant behavior. Competition is traditionally viewed as a negative impact because one party displays a negative attitude towards alternative resolution and uses power to control over the other. Conversely, group development may be impaired without it (Corey & Corey, 1992).

2.2.1. Compromise

The compromise style refers to a common solution when all parties sacrifice something to make an acceptable solution. Individuals involved in compromise tend to pursue fairness, see suggestion of a trade-off, maximize positive effects and minimize negative risks with the objective of finding an expedient outcome.

2.3.1. Accommodating

Accommodation behavior is used to describe those individuals who are willing to yield, to modify one's own needs or views for the betterment of an agreement. Such a style suggests a cooperative and harmonious approach to preserve the relationship and reduce difference.

2.3.1. Avoidance

Avoidance behavior is associated with withdrawing from dealing with conflict or tension and leaving the conflict unresolved. The tendency appears to ignore equivocation and noncommittal.

2.4. Using ICTs in competitive conflict management

Conflict management is associated with the strategies responding to conflict, self-awareness about conflict modes, conflict communication skills and establishing a structure for conflict management. Learning to employ media attributes may effectively manage and resolve conflicts and then utilize the effects of conflict to strengthen VT effectiveness. Daft and Lengel (1986) propose that ICTs have varying capacities for resolving ambiguity, negotiating varying interpretations, and facilitating understanding. Wilmot and Hocker (2001, pp. 130) suggest conflict management as “patterned responses, or clusters of behavior, that people use in conflict” through diverse communication tactics.

Past research has suggested that it is difficult to perceive competitive conflict management behavior through lean media, which substantially mask the nature of multiple cues (Tan et al, 1998). Although one party may believe that they have expressed an aggressive intention, the other party may not perceive this due to the constraints inherent to the media. Although each medium has specific capabilities and is better suited to specific situations, using a single medium may not be sufficient nor efficient. Walther (1997) referred that competitive power may encourage participants to be involved in tasks. When team members hold contrasting opinions, conflict can arise to challenge team effectiveness and performance. Lean media depersonalizes communicators and encourages them to express themselves assertively without conveying negative influences of nonverbal, emotional and other cues (Siegel, Dubrousky, Kiesler & McGuire, 1986). Also, rehearsability is helpful but when considering, restructuring or editing their text before transmitting their responses, in which communicators could articulate their message. Thus, media-switching to lean media is anticipated to mitigate a disagreeable atmosphere during a competitive conflict management.

Dennis and Valacich (1999) propose that information and deliberation exchange as the meaning of conveyance, and developing shared meaning for information as convergence are both preferred in synchronized communication. Moreover, media capability influences how VTs interact and communicate to prioritize the focus, search issue-related member and gain impromptu interaction. When VTs are faced with time-zone differences and/or time-sensitive issues, using rich media enables a quick

delivery of a large volume of information. The use of rich media is anticipated to strengthen the positive effects of competitive behavior, depending on how VT members manage to stress their knowledge, make forceful debates and explain their focus.

Since a greater variety of ICTs have been developed, the salient characteristic of media-switching could be speculated as a complementary channel which naturally extends to another more appropriate medium when the conversation content or occasion becomes complex and requires other media for better communication When an individual adopts improper strategies to manage conflicts, which results in complex consequences, the unresolved issues may lead to further communication breakdown and disagreement (Wilmot & Hocker, 2001). Therefore, conflict management should be considered "an ongoing process of handling conflict interactions" (Kim & Leung, 2000, pp. 232). This leads to the following research questions (see Fig.1):

RQ2. How are ICTs utilized during competitive conflict management?
RQ3. How would different types of VTs manage conflict in different ways?
RQ4. How would different types of VTs choose different media to manage conflict?

3. Research design and methodologies

3.1. Mixed Methodologies

This study adopts a two-dimensional approach, combining both quantitative and qualitative data to manage to generalize the view and contribute to a broad and insightful understanding of different aspects of the same phenomenon (Bryman, 2000). Adopting a single methodological approach may cause the possible bias of objective and subjective methods. Mixed methodologies were "thought to produce more valid and reliable results" (Sarantakos, 1993, pp. 156), providing feasible investigation of the latent mechanisms that conduct actions and events, and refine the structures and mechanisms that are postulated in a theory and provide a more in-depth understanding of the circumstances and conditions.

The samples were collected from 3 IT-related global corporations based in Taiwan and China. Language usage has been a fundamental concern while investigating this study. Collaborators based within global corporations use English as a common language to communicate; yet, Chinese employees may be more comfortable in using Chinese Mandarin in addition to English. Thus, language competence is a consideration.

3.2. Quantitative sampling and data analysis procedure

The quantitative method adopts questionnaire survey. The respondents' information was categorized into two aspects, which are: VTs by geographic boundaries (N=109) and language competence (N=109).

Overseas respondents based in international corporations were forwarded questionnaires by respondents through their intranet, in which the questionnaires were able to be successfully delivered. When compared with traditional face-to-face interaction, obtaining questionnaires managed via ICTs is economical and overcomes the accessibility of geographic boundaries (Burton, 2000) and approachability of strangers. The features of VTs, definition and the number of respondents used in the survey data analysis are illustrated (Table 3).

Table 3. The samples and definition

VT features	Definition	*Samples*	
Geographic boundaries			
Co-located VTs.	Members at the same workplace	*N=60*	*N=109*
Dispersed VTs.	Members are distributed globally	*N=49*	
Cultural concern: Language competence			
Chinese/Taiwanese	Communicating in Chinese	*N=60*	*N=109*
Non-Chinese Speakers	Communicating in English	*N=49*	

The questionnaire used numerical rating scales (scale: 1 to 5) and N/A, which indicates such a circumstance is not applicable to the respondents. The questionnaire investigated conflict management through IM and media-switching upon requirement, which incorporate two aspects: attitude evaluation and situation frequency. The higher scale it is the higher frequency and evaluation it indicates.

Quantitative data analysis strategy (T-test) in quantitative approach examines the linkage between the features of VTs and media-switching (from IM to e-mail, audio, VC and F2F) during competitive conflict management. The quantitative data analysis examines RQ1 and RQ4.

3.3. Qualitative sampling and data analysis procedure

3.3.1. Sampling and setting

The dimensions that sampling include are people, setting, events and time (Miles & Huberman, 1994). Qualitative and quantitative data were collected from the same corporations so that the data analysis could be compatible. The qualitative methods of

this research adopt in-depth interviews (N=17) and IM logs (N=38, 3 months). Semi-structured interviews were considered to gain insights into the diverse nature of the VTs, focusing on effective communication during competitive conflict management.

A series of IM longitudinal conversation records contained date, time of interaction and conversation content, exploring the interval of response time, language competence, language-switching and media-switching in conflict. Meanwhile, IM logs reveal a particular form of expression, as IM users change their language as a direct effect of the medium and a new 'hybrid' communication style is formed. The conversation flow in IM logs and in-depth interviews help shape the concept, which explored the use of media-switching and the strategies of utilizing media characteristics to resolve conflict between VT members.

The nature of the interviewing process (through audio and F2F) would commence with a series of semi-structured general questions. The sequencing of questions would depend on the process and independent responses given by each individual. The qualitative data analysis examines RQ2, RQ3 and RQ4.

3.3.2. Qualitative data analysis procedures

The use of computer-aided qualitative data analysis software (CAQDAS) manages to develop mechanical research tasks. CAQDAS can be used to integrate large volumes of documents, to create codes and retrieve defined text passages, to annotate texts and define codes with descriptive information (words/phrases/lines/sentences/passages), to trace and save changes to data sets (Dey, 1993; Drisko, 1998). The knowledge gained by the interviewing process provided a basic concept of how individuals use media to manage conflict. The way to see communication exchange is to read between the lines. Reviewing IM logs disclosed the detailed information that could be neglected from the interview data. The qualitative data analysis process is a highly intuitive activity to review tendencies of what has occurred and to identify regular patterns from within these events (e.g. language-switching, media-switching, response time and paralinguistic words). In an attempt to explain the complexity of such circumstances, the understanding of theory-building is a primary concern, rather than the testing of the applicability to a population. The coding scheme developed three themes, focusing on VT boundaries, media use and competitive conflict management.

The theme of *Boundaries* has been divided into three categories, reviewing geographic boundaries, time dispersion and language competence. The theme of *Media use* in the developed theoretical structure combined both 'media characteristics' and 'communication channels'. Media use differs from what media communicators can use or prefer to use; therefore, the use of media-switching is investigated. Media-switching

places emphasis on flexibility or multi-media use. Communication channels are classified in rich (audio, VC; F2F) and lean media (IM; e-mail) for communication transaction. Theme of *Competitive conflict management* investigates two categories: *Arguing* and *Controlling*. The developed theoretical structure (Fig. 4) was developed from both quantitative and qualitative data which incorporated the use of CAQDAS with theory background support.

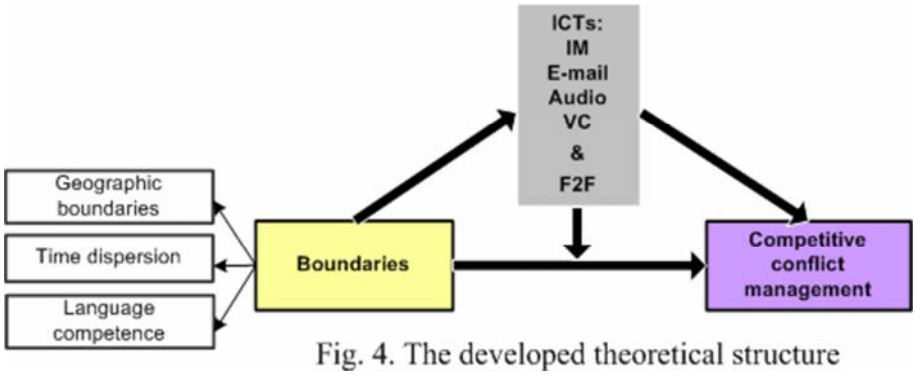

Fig. 4. The developed theoretical structure

The concept (Fig. 1) developed systematically to form a logical structure (Fig. 4). The interdependent relationships of *Boundaries*, *Media use* and *Conflict Management* demonstrate the approach to review how the features of VTs and ICT characteristics affect media choice selection during conflict management by evaluating each salient feature rationally.

4. Findings and discussion

4.1 Geographic boundaries between VTs during competitive conflict management

4.1.1. The quantitative findings for RQ1

Table 5. The quantitative findings (RQ1) of geographic boundaries between VTs

Geographic boundaries / Questions	**Co-located VTs** (1) / **Dispersed VTs** (2)			
	Mean(1)	Mean(2)	T	P<.05
a. using IM to obtain information instantly	3.72	4.10	-2.65	*.01*
b. When I need to communicate in a foreign language, I prefer using IM	3.43	4.20	-4.99	*.00*
c. In addition to IM, I switch media to				
i. *E-mail*	3.16	3.28	-.74	.47
ii. *Audio*	2.48	3.01	-2.77	*.01*
iii. *VC*	1.60	1.65	-0.43	.67
iv. *F2F*	1.92	1.49	3.03	*.00*

The feature of geographic boundaries revealed significant differences (***a***, p=0.01)

between co-located and cross-national VTs when adopting IM to obtain information instantly. This tendency suggests that cross-national VTs utilize IM characteristic of synchronicity to communicate in real-time, which overcomes geographic boundaries and potential temporal dispersion. Also, when VT members need to communicate in a foreign language, the significant finding (***b***, $p<0.05$) of using IM disclosed that cross-national VTs adopt IM at a higher level of preference than co-located VTs. This tendency could suggest that IM text-based communication enables cross-national VTs to reduce the language barriers.

The feature of geographic boundaries revealed significant differences (***ii***, ***iv***, $p<0.05$) between co-located and cross-national VTs when requesting to media-switch to audio and F2F during IM communication. Cross-national VTs would place greater emphasis on switching to audio than co-located VTs, yet co-located VTs would request F2F at a higher level of frequency than cross-national VTs. Due to the difference in time-zones and geographic boundaries, the findings of mean values in media-switching frequency (***i***, ***ii***, ***iii***) disclosed that cross-national VTs tend to use e-mail, audio or VC at a higher level of frequency than co-located VTs. However, the mean values in frequency of adopting rich media revealed that co-located VTs arrange F2F meetings (***iv***) at a higher level of frequency than adopting audio or VC (***ii***, ***iv***) due to accessible distances and a common time-zone.

The finding of media-switching frequency to VC (***iii***) revealed that both cross-national and co-located VTs revealed no significant difference. Moreover, the mean values of media-switching frequency suggest that both of these VTs would adopt VC at the lowest level of frequency but choose to adopt e-mail at the highest level of frequency. However, the use of VC may be considered overly rich to provide users with unnecessary information. Moreover, the mean values in media-switching frequency disclosed that co-located VTs tend to switch media by adopting e-mail or F2F meetings (***i***, ***iv***), and cross-national VTs tend to switch media to e-mail and/or audio (***i***, ***ii***).

4.1.2. The qualitative findings for RQ2 and RQ3

Table 6. An example of interview and IM log

Interview:

I often combine both audio and IM conversation to emphasize important points or push my side of issues if I can't arrange a meeting. But I sometimes use e-mail or IM to control my temper.

IM log:

09:53:47 AM	Al	我發mail給你了。*(just sent you an e-mail)*
10:00:00 AM	Al	他要什么给他什么。或则你来问我。*(give him what he wants or you contact me for further details)*
10:00:30 AM	Sam	**我call你好嗎？** *(Can I call you now?)*
10:04:22 AM	Al	ok
10:11:06 AM	Al	好,你三點之後再打給我或在找我, 那時後會比較有空談 *(fine, call me or see me after 3pm, I'll be available by then)*—incorporating audio
10:11:32 AM	Sam	**我正在發一些相關檔案給你** *(I am sending you some relevant files to you)*

The findings (RQ2) of adopting lean media disclosed that ICTs' 'asynchronous' and 'rehearsability' characteristics provide communicators with more time to review the issue and rephrase their text before sending the message, which should limit any confusion which may lead to an irretrievable argument during competitive conflict management. The findings of media-switching during a disagreeable argument disclosed that lean media would be employed to conceal the intent of confrontation, limit potentially disagreeable feelings or aggressive cues as it acts as a buffer to detract disagreeable concerns and maintain focus on the task. Although the use of audio communication provides a higher level of information capacity when compared with lean media, text-based communications/lean media lack sufficient social presence and language cues to limit the tension during a confrontation or a demanding situation. A well-constructed e-mail can help the current work and eliminate the potential for future disagreeable confrontations should media-switching to audio be required. Asynchronous communications through e-mail are less likely to be associated with emotional conflict, as they are more focused in their discussions (Mortensen and Hinds, 2001). Researchers considered that ICTs (especially the text-based media) are lean media, which limit social context cues, promote more equal participation and influence group members (Siegel et al., 1986). Thus, the use of lean media lacks sufficient symbolic cues, which suggests that certain negative social/context cues may be transformed to be more positive and assertive signals, so as to help accomplish the task.

Also, the findings (RQ2) of using ICTs during competitive conflict management disclosed that ICTs' characteristics of media synchronicity, presence awareness, negotiating availability, rehearsability, reprocessability, multi-tasking and media/ language-switching are utilized. The findings suggest that IM is a tool to check their counterparts' online availability while attempting to establish contacts and maintain a connection. Therefore, the process of 'negotiating availability' is supportive in delivering messages in a timely manner for impromptu interactions without the need

for prolonged conference or scheduling future prearrangements during competitive conflict management.

In addition, the findings (RQ2) disclosed that multiple media are used to exchange a flux of updated information in order to manage the task progress more effectively. Lean media are adopted to convey specific data-related information (e.g. jargons; listing file-labeling) or updates. IM is an initial step to establish contacts, to make simple enquiries and/or request and to control the flow of pertinent information specific to a work's progress. 'Multi-tasking' is employed to control the work progress during an IM conversation, which suggests that IM is applied to extend information capacity. Also, the characteristics of 'rehearsability' and 'reprocessability' through the use of lean media assist to highlight an individuals' concern or to persuade a counterpart by providing him/her with reliable information.

These findings suggest a tendency that VTs utilize IM 'synchronicity' and 'media-switching' characteristics to meet their counterparts online, raise topics, provide information and highlight concerns in an attempt to deliberate their initial concerns and to decide on the most appropriate medium to continue an ongoing communication. Such a tendency suggests that IM synchronous communication enables an effective delivery of information to accentuate individual concerns or to highlight controversial issues.

The findings (RQ3) disclosed that an accessible physical location increases conflicts between co-located VTs. Co-located VTs tend to use rich media (e.g. audio; F2F meetings) when confronting their counterparts. When co-located participants encounter a disagreeable situation, the communication breaks down. Co-located VTs tend to adopt e-mail to deliver data-related information to control a work's progress. However, the findings disclosed that when cross-national VTs encounter conflict due to contrasting opinions, they tend to adopt lean media to clarify their position and stress their concerns. The capacity of lean media to transmit social and paralinguistic cues is low (Daft and Lengel, 1986). Such a tendency suggests that the features of geographical boundaries, temporal dispersion and language competence diminish participation during competitive conflict management.

4.1.3. The quantitative and qualitative findings for RQ4

The qualitative findings suggest that when co-located VT members face potential verbal arguments, they would prefer to communicate through lean media rather than meeting in person or talking via audio. The use of rich media may lead to verbal arguments. Co-located VTs have a tendency to request media-switching to lean media when their counterparts become aggressive. While involving in aggressive competitive behavior, media-switching to lean media eliminates negative influences.

The tendency suggests that VTs tend to adopt IM, which limits hostility, to make demands so as to limit a confrontational situation. However, when negative emotions are detracted by the communication through lean media, communicators tend to switch to rich media for rational conversations. Thus, participants are able to emphasize individual concerns, make logical arguments and explain their focus without engaging in personal conflict.

Pressure for greater efficiencies for work influences media selection (Joyce, McGee; Slocum 1997). The qualitative findings disclosed that when VTs share a common or similar time-zone, they have a tendency of using IM and then switch directly to audio during competitive conflict management. However, when time-dispersed VTs attempt to express contrasting opinions, they would use lean media to schedule an audio-conference. In addition to e-mail, which is capable of overcoming time-zone differences, time-dispersed VTs would also adopt IM to reduce response time, in an attempt to make a quick arrangement for audio-conferencing. Therefore, VTs tend to use rich media when attempting to actively participate in group interaction, explore other alternatives and emphasize individual views so as to reach information convergence.

Moreover, the qualitative findings suggest that cross-national VTs choose to adopt lean media to emphasize specific topics whilst incorporating audio to persuade their counterparts and to supplement language competence. However, the findings also suggest that cross-national VTs are less likely to engage in a controversy due to problems of language competence. When global team members relate to language competence, they tend to adopt lean media to limit miscommunication, control the task progress and make demands. Using lean media in virtual environments may not successfully prompt emotional conveyance. Through the use of lean media, an aggressive intention may be difficult to detect or may be simply considered a form of concern to proceed their common task and increase working participation (Walther, 1997).

Thus, such reservations may encourage participants to explain their thoughts without disclosing an overly dominant attitude. When communicators focus on knowledge conveyance in the form of a forceful but rational debate, these positive effects encourage VT members to display their concerns openly rather than forcing their counterparts to follow a single rule. Therefore, since lean media lacks sufficient capacity to deliver large volume of information in a timely manner, richer media would be requested to accentuate individual views, which strengthens the positive effects of team effectiveness.

Table 7. The quantitative findings (RQ4) of geographic boundaries between VTs

Geographic boundaries / Questions	**Co-located VTs** (1) / **Dispersed VTs** (2)			
	Mean(1)	Mean(2)	T	P<.05
d. small talk (via IM) may be needed to smooth demanding attitude while making requests	3.70	3.82	-.74	.46
e. requesting issue-related information to continue the work	3.78	4.04	-2.78	*.01*
f. use IM to emphasize my viewpoints	3.62	3.65	-1.6	.88
g. When I push my ideas to be accepted, I would ask to switch to				
1. *E-mail*	3.23	3.33	-.49	.63
2. *Audio*	2.64	3.13	-2.22	*.03*
3. *VC*	1.60	1.71	-.72	.43
4. *F2F*	2.21	1.61	2.40	*.02*

The findings (***d***) in mean values of frequency disclosed that both co-located and cross-national VTs tend to use IM at a high level of frequency when engaging in small-talk to mitigate any demanding attitudes. This tendency could indicate that friendly interaction between co-located VTs may limit the potential for awkwardness that may otherwise impact future F2F meetings. The tendency could also indicate that cross-national VT members who engage in small-talk through IM offer friendly gestures in an attempt to avoid trouble, now or in the future.

The significant findings (***e***, p=0.01) revealed that cross-national VTs who attempt to request issue-related information to continue the work appear to use IM at a higher level of frequency than co-located VTs. The request of information for real-time assistance to advance the work suggests that IM synchronous characteristic enables real-time communications that are capable of overcoming temporal and spatial dispersion. Moreover, there is no significant difference (***f***) between co-located and cross-national VT members who use IM when attempting to emphasize their own views. The use of IM suggests that co-located and cross-national VTs utilize IM characteristic of synchronicity to highlight their key points when incorporating another medium during competitive conflict management.

When media-switching relates to competitive behavior, the findings (***1***) suggest that the frequency of media-switching to e-mail is similar between co-located and dispersed VTs. Also, the significant findings (***2***; ***4***, p<0.05) suggest that co-located VTs require a lower level of audio use but a higher level of F2F meetings when compared with cross-national VTs during competitive conflict management. However, neither the qualitative findings nor the quantitative findings suggest that the feature of geographic boundaries would affect the use of VC (***3***) or consider the use of VC necessary.

VTs tend to use IM to evaluate whether an audio conference (or a F2F meeting if accessible) is necessary in an attempt to circumvent a potentially confrontational

situation. The selected medium becomes a part of the message, revealing the intent of the message sender (Fulk, 1993). The qualitative and quantitative findings disclosed that both co-located and cross-national VTs adopt a combination of e-mail, IM and audio when forcing their views on others. After VTs communicate through rich media, the tendency suggests that participants tend to adopt e-mail to control a work's progress. These findings may imply that VTs use media-switching as a strategy during competitive conflict management.

4.2.Language competence between VTs during competitive conflict management

4.2.1. The quantitative findings for RQ1

Table 8. The quantitative data findings of language competence between VTs

Language competence / Questions	**Chinese** (1) / **Non-Chinese** (2)			
	M (1)	M(2)	T	P<.05
a. using IM to obtain information instantly	3.89	4.11	-1.31	.19
b. When I need to communicate in a foreign language, I prefer using IM.	3.74	4.34	-3.06	*.00*
c. In addition to IM, I switch media to				
i. *E-mail*	3.27	3.59	-1.60	.11
ii. *Audio*	3.31	2.78	-2.08	*.04*
iii. *VC*	1.78	1.78	0.01	.99
iv. *F2F*	2.79	3.31	-1.99	*.05*˚
˚ 0.048<0.05				

When Chinese VT members based in Taiwan and China use IM to obtain information instantly, the feature of language competence does not significantly affect the use of IM (***a***). Yet, these Chinese VT members have a stronger bias towards emphasizing the use of IM when communicating in a foreign language than when communicating in Chinese Mandarin (***b***, $p<0.05$). This tendency suggests that Chinese VT members place particular emphasis on employing IM text-based communication due to a lack of knowledge relating to language comprehension. When Chinese VT members communicate in Chinese Mandarin or in English, the findings of media use (***i***; ***iii***) revealed that the feature of language competence does not significantly affect the use of e-mail and VC. However, the mean values in media-switching frequency revealed that the use of e-mail and IM are the top two choices among other ICTs (***b***; ***i***). These findings may indicate that text-based communication is adopted to reduce language-related obstacles.

Moreover, the significant findings of media-switching (***ii***, $p=0.04$) disclosed that Chinese VT members have a tendency to adopt audio when communicating in Chinese Mandarin at a higher level of frequency than when communicating in English.

However, these Chinese VT members have a stronger tendency towards arranging F2F meetings when communicating in English at a higher level of frequency than when communicating in Chinese Mandarin (***iv***, $p<0.05$). Such a tendency suggests that language competence affects the use of rich media. Thus, when Chinese VT members need to communicate in a foreign language, face-to-face provides a richer set of capabilities than audio.

4.2.2. The qualitative findings for RQ2 and RQ3

Table 9. An example of interview and IM log

Interview:

I try not to receive calls from my foreign colleagues (in Canada) since we have language barrier and I don't want to feel their anger or involve in a serious confrontational situation on the phone when I can predict it.

IM log:

1:40:06 PM	Lorn	Damn, I call you!!!!!
1:40:34 PM	Aaron	**Wait, can you guide me online the connection process first?**
...		
1:49:08 PM	Lorn	ok, in the Nurit loader form, there is a port settings item in the title menu
...		
1:51:27 PM	Lorn	set the direct speed to be 38400
...		
1:53:30 PM	Aaron	**com2 active**
...		
2:01:37 PM	Lorn	Email me the result
2:02:58 PM	Aaron	**ok, sending now**

The findings (RQ2) revealed that lean media's characteristics of 'language-switching', 'rehearsability' and 'reprocessability' are utilized when individuals attempt to reinforce their views to be accepted. Moreover, the findings also disclosed that lean media is adopted to support linguistic comprehension (e.g. jargon, listing file labels) and to reduce the gaps in language competence, so as to control a work's progress and process information effectively. In addition, the findings (RQ3) disclosed that when Chinese VT members use English to communicate (with non-Chinese speakers) during competitive conflict management, they tend to adopt lean media to reduce the gaps in language competence, but may adopt audio when language competence is not an obstacle. The findings suggest that the feature of language competence affects Chinese VT members while managing conflict. They avoid promoting their ideas but make simple enquiries relating to the work's progress. Such a tendency suggests the feature of language affect VTs to actively participate in a common task. When Chinese VT members communicate in a common domestic language, they tend to adopt rich media to manage conflict. However, when using a common domestic language to push their own views, the resulting communication would lead to confrontation. Moreover, the findings also suggest that when Chinese VT members communicate by using either Chinese Mandarin or English through lean

media, they have a tendency to be outspoken and exert their views onto others.

4.2.3. The quantitative and qualitative findings for RQ4

When Chinese VT members communicate by using a common domestic language, the qualitative findings disclosed that they prefer to switch to lean media during a confrontational situation, in an attempt to moderate the intensity of an argument. The use of lean media reduces or eliminates language cues in the virtual environment, which create a sense of depersonalized communication (Siegel et al., 1986). The qualitative findings also disclosed that Chinese VT members have a tendency to employ multiple media (e.g. IM, e-mail and audio) to compensate for gaps in language competence when using English to make an argument. The tendency suggests that language competence prevents the use of rich media as Chinese VT members find it difficult to verbally persuade their non-Chinese speaking counterparts in English. This barrier has led to media-switching to have text-based communication.

Table 10. The quantitative data findings of language competence between VTs

Language competence / Questions	**Chinese** (1) / **Non-Chinese** (2)			
	M (1)	M(2)	T	P<.05
d. small talk (via IM) may be needed to smooth demanding attitude while making requests	3.55	4.11	-2.62	*.01*
e. requesting issue-related information to continue the work	3.85	4.06	-1.35	.18
f. use IM to emphasize my viewpoints	3.56	4.06	-2.69	*.01*
g. When I push my ideas to be accepted, I would ask to switch to				
1. *E-mail*	3.29	3.72	-1.80	.74
2. *Audio*	3.50	2.92	1.99	*.05*[*]
3. *VC*	1.82	1.85	-.09	.93
4. *F2F*	3.21	3.78	-2.24	*.03*
* 0.048<0.05				

The quantitative findings suggest that Chinese VT members would engage in small-talk (through IM) to limit the potential for demanding or disagreeable attitudes when making requests from non-Chinese speakers in a higher level of frequency than when requesting individuals whom share a common domestic language (***d***, p=0.01). Yet, the feature of language competence does not significantly affect the use of IM when requesting information to advance the work during competitive conflict management (***e***). However, the significant findings (***f***, p=0.01) revealed that when Chinese VT members need to accentuate their viewpoints to persuade non-Chinese speaking counterparts, they purposely adopt IM to compensate for gaps in language competence and to communicate in real-time.

The findings (***1***; ***3***) suggest that the feature of language competence does not

significantly affect the use of e-mail and VC during competitive conflict management. The significant findings (***2***, $p<0.05$) disclosed that Chinese VT members prefer using audio to push their ideas to be accepted when communicating with other Chinese VT members than when communicating with non-Chinese speakers. Such a tendency suggests that when Chinese VT members use a common domestic language to force their ideas to be accepted, they prefer to communicate via audio. In addition, Chinese VT members tend to meet foreign language speakers in person than when communicating with other Chinese (***4***, $p=0.03$). The tendency suggests when Chinese VT members communicate in a foreign language to reinforce their views, they would prefer to arrange F2F meetings.

5. Conclusion & Future research

5.1 Conclusion

The diversity of spatial, temporal and cultural boundaries between VT members are unique factors to affect the use of media when encountering conflict. Early conflict and groups theorists have been focusing on the negative effects of team conflict (Wall & Callister, 1995). However, strategic management incorporating ICTs is less focused on how to mitigate the negative effects of conflict. Researchers are only now starting to study how VTs function and begin to pay close attention to conflict management since the choices of ICTs have expanded. The mixed methodologies in this study have assisted the research findings and discovered linkage between VTs, media and conflict. Utilizing media-switching to a mutually acceptable medium suggests a means to achieve effective communication and team effectiveness. Media-switching to lean media alleviates such negative effects as aggressiveness, demanding attitudes and linguistic misunderstandings during competitive conflict management. Conversely, media-switching to rich media strengthens the positive effects of competitive behavior, such as group and task participation.

5.2 Future research

VTs face many challenges, including interacting with a diverse number of contrasting individuals through the media, adjusting to the virtual environment, adopting and adapting to new technologies, resolving different types of conflict and dealing with management. By combining quantitative and qualitative approaches and after sampling in geographic boundaries and cultural diversity between VTs, this research is able to examine other styles of conflict management in addition to

competitive conflict management. Meanwhile, since ICTs may conceal a great number of symbolic cues, the social hierarchy is presumed to be diminished. In the cause of having fluid and flexible interaction, managers and professionals often develop comfortable and multiple social networks to welcome the engagement of group members (Teigland, 2000). Therefore, future research should explore the effects of conflict management within the circumstances of a hierarchical system to investigate relative power－whether global virtual team participants operating in hierarchical system (superior and subordinate) feel that they share an equal power through ICTs.

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