Subgroup Formation in Partially-Distributed Global Virtual Teams: The Effects of Faultlines

Abstract

**Purpose** – Partially-distributed teams (PDTs), where some team members are colocated and some are remote, are becoming a common organizational structure. The purpose of this paper is to focus on team characteristics and processes that lead to faultlines and to understand how faultlines lead to subgroups in some cases. Subgroup within the team have both negative consequences as a result of conflict or positive consequences as a result of increased learning. The following research question is addressed: “*what characteristics and processes lead to faultline salience and the formation of subgroups in partially distributed teams?”*

**Methodology** – Rapid evidence assessment was conducted yielding 21 articles which were coded using a thematic synthesis methodology.

**Findings** - Both group characteristics and group processes can lead to faultlines in partially-distributed virtual teams. Faultlines are frequently compounded or layered by multiple characteristics and processes. Faultlines commonly align with geographic dispersion, cultural differences and language barriers. Findings suggest that more subtle themes of shared context, power, status, and configuration are significant contributors to why some faultlines are activated while others remain dormant. Subgroups frequently display in-group/out-group effects. The literature shows mixed or contradictory impacts of these dynamics.

**Practical Implications** – Managers should carefully configure PDTs and quickly establish mechanisms for shared communication and interaction.

**Originality/value** – The paper consolidates existing literature on faultlines and subgroups in PDTs, presents suggestions for managers, and identifies opportunities for future research.

*Keywords – Faultlines, subgroup impact, partially-distributed teams, in-group/out-group effects*

Subgroup Formation in Partially-Distributed Global Virtual Teams: The Effects of Faultlines

Global virtual teams (GVTs), also called geographically-dispersed or distributed teams, bring many benefits which include allowing companies to reduce travel and infrastructure costs while leveraging the best talent for the job regardless of location. The increase in GVTs is expected to continue. “More than 60% of tasks at Global 2000 companies will eventually be accomplished by distributed teams” (Connaughton & Shuffler, 2007, p. 389). A Society for Human Resource Management study (2012) suggested that approximately 66% of multinational organizations use VTs and “they are predicted to be one of the dominant organizational forms in the twenty-ﬁrst century” (Ocker et al., 2011, p. 290). As a competitive business approach to the global marketplace, geographically-dispersed teams are a cost-effective way to penetrate new markets and leverage resources.

Gaining maximum benefit from this structure involves understanding GVT group dynamics and how they occur. The anticipation of these dynamics along with pre-emptive configuration and optimal structure allows managers to avoid some of the negative effects of team conflict. *Configuration* refers to “the arrangement of members across sites independent of the spatial and temporal distances among them” (O’Leary & Cummings, 2007, p. 438) and includes key aspects of subgroup imbalance, isolation and the number of represented sites that make up a team. Team configuration and dispersion drive the degree of *virtualness* which isdescribed by Griffith and Neale (2001) as the relative absence of face-to-face contact.

For purposes of this review, GVT configuration or *virtualness* can be envisioned as a continuum from entirely colocated team members to entirely dispersed teams with remotely located single individuals who rarely interact face-to-face. The majority of GVTs fall between these two extremes into partially-distributed teams (PDTs) with some colocated and some distributed team members (Ocker et al., 2011). PDTs or semi-virtual teams can create more management challenges than either their fully co-located or fully dispersed counterparts (Webster & Staples, 2006). For example, Webster and Wong (2008) found that members of PDTs perceived colocated members more positively than remote members while fully virtual and fully colocated teams showed no perception differences.

Configuration decisions, team composition, and selection of communication media can lead to the creation of faultlines which in turn may foster subgroup occurrence if the faultlines become salient. Subgroups can negatively influence team-level cohesion, communication, and collaboration (Panteli & Davison, 2005; Polzer, Crisp, Jarvenpaa, & Kim, 2006). The negative impact of faultlines and the resulting subgroup formation can be lessened by increasing shared team identity, building a team culture and by increasing task interdependence (Starke-Meyerring, & Andrews, 2006). In some cases, subgroups can be a positive force within the team fostering learning (Cramton & Hinds, 2005) and providing a support network for group members (Robert, 2015). The formation of subgroups and their impact on team management and performance are a relatively understudied area of virtual team research (Biyun, 2008).

The purpose of this review is to develop a greater understanding of the PDT characteristics and processes that lead to faultlines and subgroups. The review is guided by the following research question: “*what characteristics and processes may lead to faultline salience and the formation of subgroups in partially distributed teams?”*  The contribution to research is a summary of the existing empirical evidence in this area, an identification of common themes within the literature and suggestions for future research directions. For practitioners, the review provides a greater understanding of subgroup formation as well as providing management strategies to reduce their potentially negative impacts. Using a rapid evidence assessment format, this paper examines the existing empirical research conducted on PDT subgroup formation.

The paper begins with an overview of the literature and theoretical background followed by a conceptual map developed for the topic. An introduction to the REA methodology and a description of the search and selection process follows. Using a *fit for purpose* (Gough, Oliver & Thomas, 2012) approach, 21 articles were selected for input and coding using Nvivo, to identify themes within the literature following a thematic synthesis methodology (Thomas & Harden, 2008). The thematic synthesis results are followed by a discussion of findings, suggestions for management, recommendations for future research and study limitations.

**Literature Review and Theoretical Background**

Research on conflict in GVTs has focused on the impacts of diversity and dispersion on conflict (e.g. Paul, Samarah, Seetharaman, & Mykytyn, 2004), the different types of conflict (e.g. Shachaf, 2008) and the impact of conflict on GVT performance (e.g. Hinds & Mortenson, 2005). Conflicts in GVTs may occur for a variety of reasons including diversity, technology failure, and language problems. Hinds and Mortenson (2005) found a significant and positive relationship between distribution and conflict stating that “task and relational conflict are greater in distributed than collocated teams” (p. 298). Though most often viewed as a negative, conflict may also have positive outcomes for the team (Gibson & Vermeulen, 2003). One reason identified for possible conflict in GVTs is the development of faultlines.

Faultlines and their impact on group dynamics were introduced in 1998 by Lau and Murnighan to explain the way that different demographic attributes of group members can potentially divide a group or team into subgroups. For example, if a group is made up of males and females, when an issue addressed by the group involves gender-related policies, the group may divide into subgroups along gender lines. The dormant gender faultline becomes *salient* depending on the issue facing the group causing subgroup formation. The subgroups within the larger team may experience in-group/out-group dynamics reflecting the work of social identity theorists (e.g. Tajfel & Turner, 1986).

Social identity theory and self-categorization theory were initially developed to address areas of intergroup relations, group process, and social conflict. Individuals tend to self-categorize, identifying with a particular group which becomes their in-group. To elevate the status of the in-group, members compare themselves to those outside the group, or those in a referent out-group. Group members tend to perceive members of their in-group more positively than out-group members (Hogg, van Knippenberg, & Rast, 2012). As individuals strengthen their bias toward the in-group, agreement between the subgroups will become more difficult to achieve (Lau & Murnighan, 1998). Social identity theory is frequently used to examine subgroup formation in PDTs. For example, consistent with social identity theory, Biyun (2008) found that individuals viewed members of the colocated in-group more favorably than distant members. Strong subgroups may become a basis for self-categorization as members seek to identify with a particular subgroup

Faultlines and their resulting subgroups have a temporal element which is also reflected in social identity theory. In-groups and out-groups tend to form early in a group’s development based on easily identifiable characteristics (Tajfel & Turner, 1986). In-group/out-group formation may be moderated if team members have worked together in the past. Prior experience on PDTs also moderates the speed at which subgroups form. According to Lau and Murnighan (1998), faultlines activated early in the group process may grow deeper and more entrenched while initially dormant faultlines may remain so. Cramton and Hinds (2005) extended the faultline model as a possible explanation for conflict occurrence in PDTs. Conflict may also be related to subgroup configuration. For example, Polzer et al. (2006) found that the two-subgroup configuration showed higher levels of conflict than either the three-subgroup or the fully-distributed configurations.

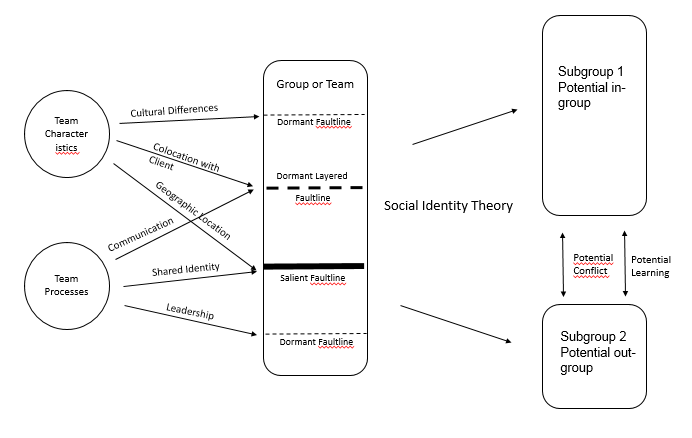
PDT literature has found conflict to have mixed or limited impact. Biyun (2008) found that conflict with colocated members had negative effects on satisfaction while conflict with remote members had no effect on satisfaction. Interview results suggested that conflict with remote teammates compared to colocated teammates was not taken as personally and was not as likely to lead to a confrontation. Geographic or location differences present the high potential for faultline development and subsequent subgroup formation in PDTs (Cramton & Hinds, 2005).

Geographic distribution has implications of cultural dispersion embedded in location; for example, a subgroup located in India will demonstrate Indian cultural norms and work patterns. In this case, the faultline that originated with geographic location is strengthened by national cultural. There are also temporal challenges inherent in geographic dispersion (Saunders et al., 2004) causing challenges of coordination across time zones. When the geographic dispersion is wide, time zone challenges reduce the number of available communication media decreasing opportunities for the use of richer channels. For example, synchronous tools that provide some visual cueing such as “chat,” “Skype” or other virtual meeting software may not be feasible when groups are dispersed across time zones (Shachaf, 2008). Colocated subgroups share context (Cramton & Hinds, 2005) and potentially both national and organizational culture in addition to benefitting from face-to-face meetings and the use of synchronous media tools. Higher levels of rich interaction between colocated members reinforce in-group/out-group effects with distant subgroups.

Demographic differences are less apparent in a virtual environment making surface-level faultlines, or those that occur because of obvious visual differences (e.g. gender, race, age, etc.), less likely (Fiol & Connor, 2005). However, geographic differences and potentially culture-based in-groups and out-groups may still occur (Brewer & Yuki, 2007). In addition to location, the literature suggests that configuration is also important (Cramton & Hinds 2005; Polzer et al., 2006). Team configuration includes issues relating to numbers of team members at each location and the location of the leader. Some subgroups may benefit from a physically present leader, providing perceived power and status to the subgroup, while others may interact with the leader only virtually (Plotnick et al., 2008).

Knowledge sharing, important to collaboration and performance (Staples, 2008) may suffer as a result of subgroups in PDTs. Team members may suffer from *colocation blindness*, the inability to see beyond the expertise within their in-group failing to fully leverage out-group resources (Bos et al., 2006). Materelli and Gupta (2009) noted differences in knowledge sharing between teams with high-status subgroup differentials, in which case knowledge sharing suffered, and low-status subgroup differentials which demonstrated higher levels of knowledge sharing between subgroups. Spontaneous knowledge sharing especially tended to be more apparent in teams with lower status differentials between subgroups. Despite knowledge sharing challenges, increased learning is a potential benefit of subgroups.

**Conceptual Model**

Figure 1, shows the relationships suggested by the literature review between team characteristics, processes, faultlines and subgroup formation. These faultlines may be dormant (the light dashed lines), or they may become salient (the heavy line). Layered faultlines occur when more than one characteristic or process align. When a faultline becomes salient, the mechanisms and behaviors explained by social identity theory are activated leading to subgroup formation. The relationships between subgroups, though frequently conflictual, may lead to positive learning, knowledge and resource sharing. 

*Figure 1.* Faultline and subgroup formation in partially-distributed virtual teams.

**Methodology**

This paper presents a rapid evidence assessment (REA) of faultlines and subgroup formation in PDTs’ research identifying several of the most common themes relevant to researchers and managers. An REA is intended to provide a quick identification and assessment of the main topics in a given research area yet it is still approached with rigor and transparency (Thomas, Newman & Oliver, 2013). Thematic synthesis methodology (Thomas & Harden, 2008) was used to identify themes across the resulting pool of included studies. Thematic synthesis was used to analyze and combine results of heterogeneous studies.

**Search criteria**

PDTs are a relatively new area of virtual teams’ research with limited empirical evidence. The empirical data available is heterogeneous regarding the research questions asked, the populations studied and study methodology used among other differences. Terminology creates additional challenges as terms are not used consistently among researchers. For example, the teams of interest are alternatively called partially-distributed teams, hybrid teams, mixed-media teams and semi-virtual teams, among others. The factors of interest in this review are variously described as faultlines, subgroups, and in-group/out-group effects. Despite the challenges, it is important to attempt a search that is in line with the general principles of structured reviews to be transparent, accountable and replicable (Hammerstrøm et al., 2010; Lefebvre et al., 2010).

This REA was designed to be purposive not exhaustive with the goal of interpretive explanation and not prediction (Doyle, 2003).  As such, the search was limited to a single search string: (subgroup\* OR faultline\* OR "fault line\*" OR "in group\*" OR ingroup\* OR in-group\* OR "out group\*" OR outgroup\* OR out-group\*) AND ("virtual team\*" OR "distributed team\*" OR "dispersed team\*"). Details of the search are outlined in Appendix A.

**Quality assessment**

As noted above, the data was heterogeneous regarding topics, settings, methodology, survey measures, and focus.  Each study was assessed for credibility, transferability/applicability, consistency/dependability, and confirmability (Lincoln & Guba, 1985).  Studies were rated as fair, good, and excellent. In selecting the final articles to be synthesized, the greatest weight was given to *applicability* which was interpreted as a *fit for purpose* measure (Gough et al., 2012) of a study’s utility in addressing the research question.

The 21 articles coded for analysis (see Appendix B) displayed the following characteristics:

* Fourteen involved student subjects; seven involved industry participants and settings.
* Fifteen were quantitative; four were qualitative while two were mixed method studies.
* Nine were published in peer-reviewed journals, nine were conference proceedings, one was a thesis, one was a dissertation, and one was from an open-access university journal.
* Fourteen were specifically globally focused with the remainder based on subgroup effects with general applicability. Four were based off the Shape Factory Game.
* Publication dates ranged from 2004-2016.

The heterogeneous nature of the data, the preponderance of student subjects and the fact that not all were globally focused raises generalizability concerns. Using student teams for virtual teams’ related research is common, and while not optimal, these studies do indicate patterns and insights that appear to transfer to the work environment. Full-semester timeframes, real-world-type tasks and grade motivators help make student team studies applicable to workplace settings (Ocker & Kracaw, 2011). Also, since slightly less than half of the included studies are peer-reviewed, there may be some validity questions. However, despite the importance of the topic, and a large research base on faultlines and subgroup formation in traditional (colocated) teams, the research stream on subgroups in PDTs is as yet largely undeveloped. The purpose of the review is to investigate trends in the data and these are identifiable and provide insight into the topic despite quality concerns.

**Synthesis**

“The term synthesis is used to refer to the stage of a review when the evidence extracted from the individual sources is brought together in some way” (Mays et al., 2005, p. 8).  Thematic synthesis (TS) was chosen as a framework for the analysis portion of the review. TS is an inductive tool designed to shed light on the interrelationships between various concepts (Thomas & Harden, 2008).  It translates concepts from one study to another using an iterative approach to thematic development.

TS works for a variety of study methodologies, and it accommodates heterogeneity in the data which is why, in part, it was chosen for this review.  One of its strengths is the ability to “draw conclusions from common elements of otherwise heterogeneous data” (Lucas et al., 2007, p. 4).  Based on Thomas and Harden’s framework (2008), the findings and results specific to faultline and subgroup formation of the 21 articles were inductively coded. The initial coding process was intended to reduce the data and identify themes. 196 pieces of extracted data and 26 initial codes emerged from the data. The initial codes were then categorized into data-driven descriptive themes. In the final level of coding, two broad, higher-level categories emerged – group characteristics and group processes. Also, *trust* was a theme that frequently appeared throughout the articles examined. Since trust could be categorized as either a team characteristic or a team process, it was examined separately.

**Results**

**Group Characteristics**

The faultline and subgroup literature developed for face-to-face teams suggested that faultlines can form along gender, racial, and functional lines among other demographic factors. In the case of PDTs however, the most common faultlines occur based on geographic location and team configuration. In the thematic synthesis, within the *team characteristics* heading, geographic dispersion was the most commonly noted finding with 37 extracted results from 11 of the studies supporting this theme. Biyun (2008) noted that geographic location was a basis for self-categorization with team members labeling themselves as part of the geographic subteam (e.g. the Hong Kong team versus the UK team) although they were all part of a larger team.

Polzer et al. (2006) also noted the tendency for team members to self-categorize based on location. Stronger identification with the in-group potentially led to bias against the out-group members (Biyun, 2008). Also, geographically dispersed team members were less likely to exchange personal information or to develop personal relationships (Cramton & Webber, 2005) and colocated teammates reported less conflict and more trust compared to distributed members (Polzer, et al.). Team member location also tended to define task assignment regardless of whether or not that assignment made sense from a skills perspective, a tendency that potentially exacerbated geographic subgroup faultlines (Polzer et al.).

Geographic divisions tended to be reinforced or strengthened by related factors causing *layered* (Lau & Murnighan, 1998) or deeper faultlines. For example, Materelli and Gupta (2009) found that subgroups colocated with the client or customer experienced a status effect adding to the geographic faultline. Subgroup location either closer to the client, at headquarters or with the leader, added a perception of higher visibility, faster decision making, and prestige all of which potentially contributed to negative subgroup effects (Materelli & Gupta). Ocker, Huang, Benbunan-Fich, & Hiltz, (2011) noted both temporal and cultural effects combining with geographic dispersion to strengthen location-related faultlines.

Privman and Hiltz (2008) found that time zone challenges were a factor in their research suggesting that significant time differences can emphasize geographic dispersion effects. Panteli and Davison (2005) studied the cumulative effect of geographic distribution and subteam homogeneity as a potential for deep faultline creation; more homogeneous colocated subteams experienced deeper faultlines. According to Polzer et al., (2006), subgroup members experienced less trust and more conflict with other subgroups when subgroup members were culturally homogeneous. The geographic distribution faultline is also frequently layered with the impact of cultural differences.

Eight of the 21 studies in the review discussed cultural differences with Biyun (2008) noting that “subgroup salience became intensified when cultural differences combined with geographic distance” (p. 47). Differences in work habits and strategies for problem framing between subteams of different nationalities (Hinds & Neeley, 2014) and differences in communication media preferences based on a collectivist approach (Hung, 2008) deepened subgroup challenges. Cultural differences in tolerance for ambiguity could result in differing expectations for rules necessitating more formal structure between subgroups of different nationalities. Subteams with similar attitudes toward ethics, work processes, priorities, and expectations tended to work well together (Privman & Hitlz, 2008). Language can also be a contributing factor to faultline salience.

Language differences led to frequent miscommunications (Panteli & Davison, 2005), while language insecurity led subgroups whose primary language was not the lingua franca of the main group to prefer asynchronous communication tools (Hung, 2008). Since social information and relationship building is typically done synchronously, this may lead to decreased trust and increased conflict between subgroups. Language asymmetries increased negative subgroup effects when combined with power or other status factors (Hinds & Neeley, 2016). Power dynamics acted as a moderator on “the relationship between faultlines and the presence of divisive subgroups” (p. 553). Other important characteristics that emerged in the thematic synthesis include team structure and physical configuration which looks at numbers and sizes of subgroups. In addition to team characteristics, group processes contributed to subgroup occurrence.

**Group Processes**

Group identity, communication, leadership and media selection emerged from the data as the most common group process themes. Ten of the 21 articles reviewed discussed issues of shared identity in their findings. In semi-virtual teams, group members tended to rate their colocated colleagues more highly than remote colleagues (Webster & Wong, 2008). Panteli and Davison (2005) suggested that deeply divided subteams in a two-subteam configuration found it increasingly difficult to develop a shared identity. Ocker, Rosson, Kracaw, Hiltz, and Plotnick (2009) observed an “out of sight, out of mind” effect that contributed to the difficulty in creating a shared identity. Hinds and Mortenson (2005) noted a link between the lack of shared identity and a lack of spontaneous communication created by geographic dispersion in PDTs.

The relationship between geographic dispersion and subgroup effects relies on group processes such as communication and coordination (Cramton & Webber, 2005). Colocation facilitates both spontaneous, relationship-building communication and task-related communication. Spontaneous communication builds relationships and reduces conflict (Hinds & Mortenson, 2005). Bos et al. (2006) noted fewer text-messages, hence less relationship building, by colocated members with remote colleagues. Cramton and Webber noted that colocated members communicated less frequently and exchanged less information with remotely located teammates. Differences in communication patterns between colocated teammates and remote subteams reinforces social categorization already established by geographic distribution.

Communication patterns emerge based on the convenience, ease of use and effectiveness of communication media. Themes presented in the synthesis included differences between synchronous and asynchronous communication. Synchronous communication had the advantage of building stronger social ties (Panteli & Davison, 2005) while asynchronous communication alleviated some time zone issues (Privman & Hiltz, 2008), and facilitated communication by non-native speakers of the shared language by allowing members to rehearse their messages (Hung, 2008). Privman and Hiltz found differences between the perception of media and its actual use. For example, synchronous media, such as video-conferencing, while perceived as useful, suffered from frequent technical problems and was rarely used. In the same study, IM’ing seemed to serve as a reasonable substitute for face-to-face interaction having an element of spontaneity and informality that encouraged frequent communication, relationship and trust development.

Hinds and Mortenson (2005) linked spontaneous communication to shared context. Shared context is an overlapping theme within both team characteristics and team process. As a team characteristic, it is closely related to geographic distribution as context includes issues of time zones, holidays, work norms, use of common acronyms and other language conventions and work environment. Hinds and Mortenson found levels of shared context to be predictive of both task and to a lesser degree, relational conflict. Martelli and Gupta (2009) suggested that shared context acted as a moderator for status cues on expertise attribution. Shared context, as well as team identity, can be influenced by leader behaviors.

In PDTs leaders must assist in bridging distance and other faultlines (Ocker et al., 2011). Webster and Wong (2008) reported frequent comments in open-ended interviews about the importance of the leader in developing cohesiveness and a sense of belonging. Leaders in the Hinds and Mortenson (2005) study communicated at least three or four times per week with team members which emphasized the important role of the team leader in maintaining shared identity. Active and effective coordination efforts can lead to higher levels of team trust and cohesion in PDTs (Paul, Drake, & Liang, 2016).

**Trust**

Trust defies categorization as either a group characteristic or a group process. In the data set reviewed for this paper, trust appeared as a frequently mentioned though little-understood team concept closely related to team cohesion, shared identity, and in-group/out-group effects. In PDTs, members trusted their colocated members more, communicated with them more frequently and perceived their skills to be higher than remote members (Webster & Wong, 2008). Paul, Drake & Liang (2016) found that high levels of trust and cohesion between national subgroups led to better global problem-solving between binational teams. Trust and team cohesion are reciprocal effects closely tied to coordination and cooperation between subgroups. Trust has a temporal element requiring time and interaction to develop with virtual teams theoretically able to achieve trust levels comparable to colocated teams given time (Walther & Bunz, 2005). Materelli and Gupta (2009) confirmed this effect in the PDTs they observed noting that over time, team members developed higher levels of trust.

Trust remains closely linked to the development of personal relationships which can be difficult to develop in distributed teams. Panteli and Davison (2005) observed that in the teams with low-impact subgroups, sharing of personal information led to trust development while in teams with high impact subgroups, personal relationships did not develop leading to a lack of trust. When significant and layered faultlines lead to deep divides in subgroups, mistrust may arise as observed by Hinds and Neeley (2014). Subgroup configuration impacts trust development. Fully colocated teams and fully dispersed teams achieve similar levels of trust (Webster & Wong, 2008) while PDTs may experience lower levels of trust especially in a two-subgroup configuration. In the Hinds and Neeley (2014) study, for example, deep faultlines triggered by language asymmetry and augmented by power and status factors, created significant mistrust between two subgroups. Polzer et al. (2006) confirmed the effect of configuration on mistrust finding that trust levels were highest in a fully distributed configuration and lowest when there were two subgroups.

**Isolates**

The interactions of interest in this review include relationships between colocated or remote subgroups. However, many distributed teams have distributed subgroups in addition to remote individual members or *isolates*. Though lightly studied, research suggested that individual remote members may experience surprisingly positive effects. Bos et al., (2010) observed that isolates grouped together (virtually) and formed a subgroup in response to being ignored by the colocated in-group. In another Bos et al. study (2006) isolates were able to earn more than their colocated trading counter-parts perhaps due to the absence of the social pressure more common with colocation.

Isolates, at least in short-duration teams were able to better focus their cognitive efforts on the task at hand and were not subject to the politics of the colocated subgroup (O’Leary & Mortensen, 2010). Further, isolates were specifically included by the dominant subgroup even when the minority subgroup was excluded (O’Leary & Mortensen). Isolate inclusion may occur for several reasons. Without a colocated in-group, isolates may self-categorize with the next most relevant group, in this case, the dominant subgroup. For the larger team, a single remote member may not trigger an out-group effect or negative reaction suggesting that while subgroups tend to compete with each other, isolates avoid the competitive dynamic. In the O’Leary and Mortensen study, isolates were not rated lower than colocated team members regarding contribution to the group outcome. Isolates may at times play devil’s advocate and therefore contribute to group knowledge by questioning majority opinions and introducing new ideas.

**Discussion**

As shown in the conceptual model and confirmed by the analysis, both team characteristics and team processes may generate faultlines. Unlike faultlines in traditional teams which occur along demographic characteristics such as gender, race, and age, based on the available empirical evidence, faultlines in PDTs occur most frequently along geographic lines. Geographic faultlines may be deepened by layering issues of national culture and language as well as context and temporal challenges. When triggered, faultlines frequently lead to subgroups. Consistent with social identity theory, individuals will self-categorize into a favorable or attractive in-group (subgroup), and may display negative behaviors or feelings toward an out-group. In-group/out-group effects in PDT subgroups impacts team performance outcomes either negatively (most frequently) or positively.

The data also highlighted the importance of subgroup configuration on levels of conflict and in-group/out-group effects. Balanced teams and teams with more than two subgroups seemed to fare better than imbalanced subgroups where there may be a large, dominant majority subgroup. The two-subgroup configuration seemed to lead to a more competitive atmosphere. The idea of competition is also reflected in under-researched yet important themes of subteam power and status. Power and status created by colocation with the client, leader, or at headquarters exacerbated in-group/out-group effects in some studies. Language also conveys power and status. For example, subgroups whose members were native language speakers in the lingua franca of the larger team enjoyed higher status. Language was also used as a barrier to inter-subgroup communication. Subgroups who used their shared language as opposed to the common team language created a communication barrier with other-language subgroups.

Language and communication are also important factors for developing shared identity, trust and team cohesion. Miscommunication between subgroups due to language or technology problems leads to lower levels of trust and cohesion. Language differences, time zone issues, and a lack of synchronous media use lowers the level of spontaneous communication on the team. This lack of spontaneous communication may lead to lower levels of trust and cohesion.

**Suggestions for Management**

Managers can use numerous techniques to help reduce subgroup formation (Ocker et al., 2009; Ocker & Webb, 2009) or to mitigate negative effects when they form. These include optimizing configuration strategies as the team structure is developed and intentionally using technology for socialization. Replacing the casual interaction missing from electronic communication helps build trust and create the perception of closer proximity (Mathieu, 2010). Team configuration may be driven by practical issues based on existing resource location. However, managers may still be able to balance subgroups and to anticipate structural challenges. For example, since the dominant subgroup may be unaware of isolate or minority subgroup qualifications or activities, managers can take steps to highlight accomplishments and contribution from these less visible contributors. If English is going to be the lingua franca of the larger team, establishing clear guidelines for team communications will be useful.

Quickly creating a team culture that is shared across sites can mitigate negatives of subgroup formation while promoting greater synergy and reducing conflicts (Huang & Tauth, 2008; Kankanalli et al., 2007; Privman & Hiltz, 2008). Managers can facilitate the intentional creation of a team culture that spans subgroups as opposed to allowing ad hoc subgroup cultures to form. As faultlines tend to form early (Lau & Murnighan, 1998), managers should act quickly to establish a shared team identity, shared goals (Paul, Drake & Liang, 2016), and shared team view (Maznevski & Chudoba, 2000). Trust development can be encouraged by facilitating spontaneous communication by providing time, space and reliable technology that encourages sharing. Sharing contextual information - respecting local holidays, shifting meeting times to accommodate different time zones, facilitating occasional site visits – can encourage trust and cohesiveness.

**Study Limitations and Directions for Future Research**

REA’s by definition are not exhaustive and instead provide preliminary insight into the topic. Additional data mining and database searches are recommended to more thoroughly explore the subject matter. The search suffered from the complexity and inconsistency of the terms used by researchers in describing the topics of interest. Also, the studies included here were limited to those where subgroups were a major variable in the study. Subgroups may play minor roles in other VT research and additional studies may be found using a less direct search approach.

Research suggests that VTs can achieve similar levels of social relationships and trust if given enough time (e.g. Walther & Bunz, 2005). Plotnick, Hiltz and Privman (2016) also found that the negative effects of subgroups in PDTs diminish over time. However, none of the included studies were longitudinal. Student group projects, a majority of the evidence, tend to be fairly short. Additional longitudinal studies of subgroups in VTs would help answer this question. As previously noted, the majority of evidence in this review is based on student participants who tend to face different pressures and contexts from those in the workplace. Students may be less familiar with other cultures and student groups tend to experience different power structures compared to their workplace counterparts. There is a clear need for methodological alternatives to student groups and lab settings in virtual team research. Suggestions for future research include a call for more longitudinal, industry-based, group-process focused studies.

Interpreted broadly, team configuration may include both subgroups and isolated individual members in a variety of combinations. The impact and contribution of isolated members within the context of a larger team is an area that is as yet relatively unexplored. Also, the studies included in this review focused primarily on subgroups in teams within a single organization. As technology-facilitated strategic alliances and global partnerships increase, there is a growing need to understand how inter-firm teams which cross organizational boundaries can optimize performance. In an inter-organization scenario, the different organizational cultures create additional boundaries that may deepen faultlines. The subgroup literature does not yet appear to encompass this application of the structure beyond student groups who may be part of different schools. “Global organizations and markets demand more transnational coordination” (Earley & Mosakowski, 2000, p. 47). Understanding team faultlines and resulting subgroups can help managers succeed in the technology-mediated, global environment.

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Appendix A

Search Criteria

Articles were identified from searches of ABI/INFORM Complete and Scopus. These data bases were chosen over others available as providing the largest numbers of returns of retrievable results when key words such as “partially distributed teams” or “faultlines” were tested. Data mining provided additional articles as did personal contact with an established scholar in the field.  Because of the limited number of articles available on this topic, the inclusion criteria was fairly broad:

* Available through UMUC’s databases, specifically ABI/INFORM Complete, and Scopus.
* Peer-reviewed studies published in academic journals, conference papers or other academic works.
* Studies that provided an abstract.
* English language text only.
* Studies published between 2000 and 2016.

Non-primary research (thought pieces, theory and framework development) were excluded from the pool of coded articles. An ABI/INFORM search yielded 124 results. A title and abstract review generated 16 articles that met the search criteria. A search of Scopus generated 156 hits of which 29 applied to the topic after an abstract and title review. After eliminating duplicates, and adding three articles from an expert in the field, and five articles developed from data-mining, 30 articles were reviewed in detail. Of these, seven were not empirical. The remaining 23 articles were read a second time with two eliminated as not relevant to the topic. Findings from the remaining 21 articles were coded using NVivo.

Appendix B

Studies Included in the Thematic Synthesis

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Author (see references for complete citation) | Year | Type | Publication Type | Global (Y/N) | Brief study description | Quality |
| Biyun, P. | 2008 | quant | Thesis | Y | Student teams, 10 wk duration, N = 56, most US, 1 Hong Kong, 1 netherlands. | G |
| Bos N, Shami NS, Olson JS, Cheshin A, Nan N | 2004 | quant | CP | N | 130 participants, 97% students, rounds of trading game to test ingroup/outgroup effect based on colocation only. Set up with 5 colocated and 5 remote players per round. | F |
| Bos, N.D., Buyuktur, A., Olson, J.S., Olson G.M., Voida, A. | 2010 | quant | CP | N | 130 participants, 97% students, rounds of trading game to test ingroup/outgroup effect based on colocation only. Set up with 5 colocated and 5 remote players per round. | F |
| Bos N, Olson J, Nan N, Shami N, Hoch S, Johnston E | 2006 | quant | CP | N | 130 participants, 97% students, rounds of trading game to test ingroup/outgroup effect based on colocation only. Set up with 5 colocated and 5 remote players per round. | F |
| Cramton, C. D., & Webber, S. S. | 2005 | Mixed | PRJ | Y | 256 survey participants representing 39 teams plus interviews with 10 project managers. Teams involved had varying degrees of dispersion. Grouped as either collocated or not. | Exc |
| Hinds, P. & Mortensen, M. | 2005 | quant | PRJ | Y | 43 teams from a MNC, 21 colocated, 22 in two or more locations. Europe & US | Exc |
| Hinds, P., Neeley, T. & Cramton, C. J. | 2014 | Qual | PRJ | Y | ethnographic data (interviews) collected from 96 indivudals representing 16 teams with members from the US, India and Germany. | Exc |
| Hung, Yu-ting Caisy | 2008 | quant | CP | Y | 33 4-member student teams, 2 week project, US & Asia (12 hr time difference) | F |
| Mattarelli, E., Gupta, A. | 2009 | Qual | PRJ | Y | Eight cases using distributed teams with members in the US and India. | G |
| Ning, N. | 2006 | Quant | Diss | N | Lab situation with many rounds of trading game (Bos). | F |
| Ocker, R., Huang, H., Benbunan-Fich, R., & Hiltz, S. | 2011 | quant | PRJ | N | 12 week, student teams. Same US university. Main campus and two branch campuses. | G |
| Ocker, R., Rosson, M. B., Kracaw, D., Hiltz, S. R., & Plotnick, L. | 2009 | Mixed | CP | Y | 84 eight person student teams with four-week project. Universities from North America, Europe and Asia. | F |
| O'Leary, M. B., & Mortensen, M. | 2010 | quant | PRJ | Y | 62 student teams from the US and Canada.Tested balance and team config. | Exc |
| Panteli, N., & Davison, R. | 2005 | Qual | CP | Y | Eight student teams from UK and Hong Kong. Semester long project. | G |
| Paul, R., Drake, J. R., & Liang, H. | 2016 | Quant | CP | Y | Student teams from US and India (India subgroups included some European Exchange students). 14 teams, 112 total participants | G |
| Plotnick, L., Hiltz, S. R., Ocker, R., Rutkowski, A. F., & Rosson, M. B. | 2008 | quant | CP | Y | 360 students in the US and Netherlands. 4 week project. | G |
| Polzer, J. T., Crisp, C. B., Jarvenpaa, S. L., & Kim, J. W. | 2006 | quant | PRJ | Y | 45 student teams. Grad students from 14 schools in 10 countries. | Exc |
| Privman, R., & Hiltz, S. R. | 2008 | qual | CP | N | Semi-structured interviews with 14 industry professionals. Not global. | G |
| Robert, L. | 2015 | quant | Jour | N | Student teams, online course, 45 day project, 3-5 member teams. US only. | F |
| Staples, D. S., & Webster, J. | 2008 | quant | PRJ | Y | n = 985 employees from large global high-tech firm. | Exc |
| Webster, J., & Wong, W. P. | 2008 | quant | PRJ | Y | 453 surveys of professionals in NA, Europe and Asia. 79 colocated, 118 all remote and 256 semi-virtual (PDT). | Exc |