# GRA 19502

Master Thesis

Investigating the interaction of team virtuality, cultural diversity and team member adaptivity in relation to perceived subgroup formation and how it affects team effectiveness

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# - Investigating the interaction of Team Virtuality, Cultural Diversity and Team Member Adaptivity in relation to Perceived Subgroup Formation and how it affects Team Effectiveness-

Hand-in date:
27.08.2018

Advisor:
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Programme:
Master of Science in Leadership and Organizational Psychology
Master of Science in Business - Leadership and Change

# Content

# **Acknowledgements**

First and foremost, we would like to express our deep gratitude towards our supervisor, Professor Elizabeth Solberg, for her thorough support, constructive feedback, guidance, and kindness throughout this process. She has provided us with great ideas and inspiration and constant encouragement for us to achieve the best result possible.

Secondly, we would also like to thank the faculty members from Leadership and Organizational Psychology and Leadership and Change for their guidance on the steps towards writing this thesis and inspiring us to look more critically at the world around us.

Thirdly, it would not be possible to write this thesis without the contribution from the participating organizations, teams, and individuals. We would like to express our huge appreciations towards the people and teams which participated. We would like to thank each one of them for their time, information, and participation. A special thank to our contacts who showed interest in our thesis and disseminated our survey to their teams.

Lastly, we would like to express our graduate towards family and friends for their constant support and encouragement throughout this process.

# Summary

This study aims to examine the interaction of virtuality, cultural diversity, and team member adaptivity in relating to team effectiveness, and the role that perceived subgroup formation plays in mediating these relationships. We propose that perceived subgroup formation is negatively associated with team effectiveness and that, virtuality as measured by working virtually (proportion of time spent working face to face vs. other media), working asynchronously (proportion of time spent working through non-simultaneous communication), and member virtuality (dispersion of members across different locations) is positively associated with perceived subgroup formation. Further, we propose that cultural diversity, as measured by differences in individualism scores between team members, interacts with virtuality in a way where perceptions of subgroup formation are strengthened, and thus has a negative influence of team effectiveness. On the other hand, we propose that team member's interpersonal adaptivity are negatively associated with perceived subgroup formation and interact with cultural diversity and virtuality as well in relation to perceived subgroup formation.

Regression analysis on a sample consisting of 174 employees engaged in virtual teams was conducted. The results show that there is a positive relationship between virtuality and perceived subgroup formation, but we found no significant relationship between perceived subgroup formation and team effectiveness. Furthermore, cultural diversity did not amplify the positive relationship between virtuality and perceived subgroup formation, nor did interpersonal adaptivity weaken the relationship. The result, however, did show that team member interpersonal adaptivity has a positive relationship with team effectiveness. Implications and suggestions for future research are also discussed.

# Introduction

Due to growing trends in globalization, demographic movement has influenced the multicultural composition in organizations and working groups (Hirst, Thompson, Bromley, and 2015) This movement continues to develop in the age of flourishing Internet and online platforms, where people can easily interact with other people from different places and background. Global teams are organizational adaptation created to meet the needs of the globalized marketplace which essentially are teams that are distributed across national boundaries (Wildman, Salas, and Scott, 2014). Virtual teams can be defined as teams in which members use technology to interact with one another across different geographic locations, and/or organizational boundaries (Martins, Gilson & Maynard, 2004).

Given that global teams and virtual teams have similar drivers and reflect similar changing realities in the world of work, it is no surprise that dealing with cultural differences in virtual teams has been an increasingly important topic in management practices. Furthermore, a formal study has found that approximately 66% multinational organization use virtual teams (Gilson, Huang, Kirkman & Shapiro, 2015). Yet, despite the apparent intersection between the two and the similar drivers (flexibility, task dependencies, the development of electronic trends, etc.), research that analyzes how the two augment and interact with each other is relatively scant. According to a literature review by Gibson et al. (2015), of the 392 papers published between 2000-2013 on virtual teams, only 4.6% of studies assessed nation or culture and included it in the empirical analysis and only 2% of studies analyzed national and cultural diversity and electronic dependence/ computer-mediated communication. As a result, the interaction effects between virtual teams and cultural diversity on team processes and outcomes have been under-examined.

Within the field of study on virtual teams and cultural diversity, one aspect that scholars indicate require specific investigation in the is the formation of subgroups (Gilson et al., 2015), defined as a social categorization on teams with geographically dispersion (O'Leary & Mortensen, 2010). Given the fact that virtual teams are usually composed of members from different geographic locations, as well as different nationalities, such teams have more tendency to experience the creation or perception of subgroup formation (O'Leary & Mortensen). Subgroups can be based on different factors such as cultural

similarities, time zones, language (Gilson et al., 2015). Whereas the perception of subgroups in face-to-face teams is mostly affected by demographic characteristics, subgroup in virtual teams can be based more on co-location and the extent of communication with team members (Martins et al., 2004). According to O'Leary & Mortensen (2010), subgroups formed by geographic dispersion in such global virtual teams can lead to several negative outcomes such as hindered communication, reduced trust and increased conflicts. Therefore, in the growing trend of global virtual teams, subgroups can be an important in research in the interaction of virtuality and cultural diversity.

Researchers have generally used Inputs-Processes-Outcomes model (I-P-O models) in order to understand how virtuality and/or cultural diversity affect team effectiveness (Ilgen, Hollenbeck, Johnson & Jundt, 2005). These models imply that virtuality and cultural diversity operate in a system of contextual factors wherein they, as inputs, affect team processes and in turn team outcomes (McGrath, Arrow, Berdahl 2000).

In order to better understand the research aspects outlined above, we looked at literature which focuses on virtuality and cultural diversity in teams, the formation of subgroups in teams, and team member adaptive performance and derived a number of hypotheses. Our study, conducted among 174 workers working virtually (both in domestic and international teams) contributes to the literature with an examination of the relationship between these variables with virtual team performance, measured by task performance, member satisfaction and group integration.

## Key Constructs and Literature Review

The aim of this section is to provide a review of key constructs and existing research on each as basis for developing research questions and developing our study's hypotheses.

### *Virtuality*

According to Gibson et al. (2015), while frequency of the usage of electronic communication represents the most frequently occurring representation of the construct of virtuality, virtuality is actually a complex, multidimensional construct requiring several measures. Mesmer-Magnus, DeChurch, Jimenez-Rodriguez, Wildman & Schuffler (2011) propose a framework where virtuality is

multi-dimensional and includes: *(a)* the extent which computer-mediated tools are used in team processes or **working virtually**, *(b)* the amount of information transmitted using these tools, and (*c*) how asynchronous/ synchronous the interaction is (the extent which response in real-time vs. lagged time is required) or **synchronicity**. They found that higher degrees of virtuality in the above three mentioned dimensions increased sharing of unique information, but reduced overall openness of information sharing. This has differential impacts depending on the type of team: for virtual teams, open information sharing is more important, while unique information sharing is more important for face-to-face teams. Furthermore, the effects of virtuality are curvilinear, meaning that at low levels of virtuality, information sharing is improved, while at higher levels information sharing is diminished. This seems to imply that across different contexts, the influence and importance of virtuality varies.

According to Gilson et al. (2015), research design in understanding virtuality as a construct has tended to be comparative in nature--with face-to-face team being compared with virtual teams. Kirkman and Mathieu (2005) have suggested this assumption is problematic, because it creates the false assumption that teams lie in a dichotomy of being either virtual or face-to-face, which is not ecologically or externally valid. More realistically, most teams are reliant on elements of virtuality in the form of computer mediated technologies. As a result, Kirkman and Mathieu propose the concept of team virtuality which teams can be measured based on the extent and value of computer mediated communication and information technologies are integral to how the team functions. Fiol and O'Connor (2005), suggest that the extent of how often these communications and information technologies is used is dependent on how often the teams meet in person vs. online, which influences team identification and the prevalence of fault lines.

In addition to electronic dependence, according to O'Leary and Cummings (2007), one important element of virtuality that needs to be considered is geographic dispersion. They argue that geographic dispersion should be differentiated amongst three dimensions: (*a*) **spatial** or the average physical difference between team members, (*b*) **temporal** or the extent in which the team members have differences in working hours, and (*c*) **configurational** or "the number of sites which members are located, their isolation from other members, and the balance between subgroups of members on each site" (O'Leary &

Cummings, 2007). Using this framework, subsequent research found that the dimensions have differential effects on coordination. According to Espinosa, Cummings & Pickering (2012), temporal dispersion had greater effects on team performance than spatial dispersion.

Duxbury and Schweitzer (2010) builds upon O'Leary and Cumming's configurational dimension, through member virtuality or the degree to which members are dispersed or co-located. They found that the proportion of members stationed at different locations were significantly related to virtual team effectiveness measures such as performance and satisfaction. As expected, the correlation was negative. This can also be referred to as **member virtuality.**

**Figure 1: A visualization of a multi-dimensional model of virtuality based on synchronicity, member virtuality, and working virtually.**
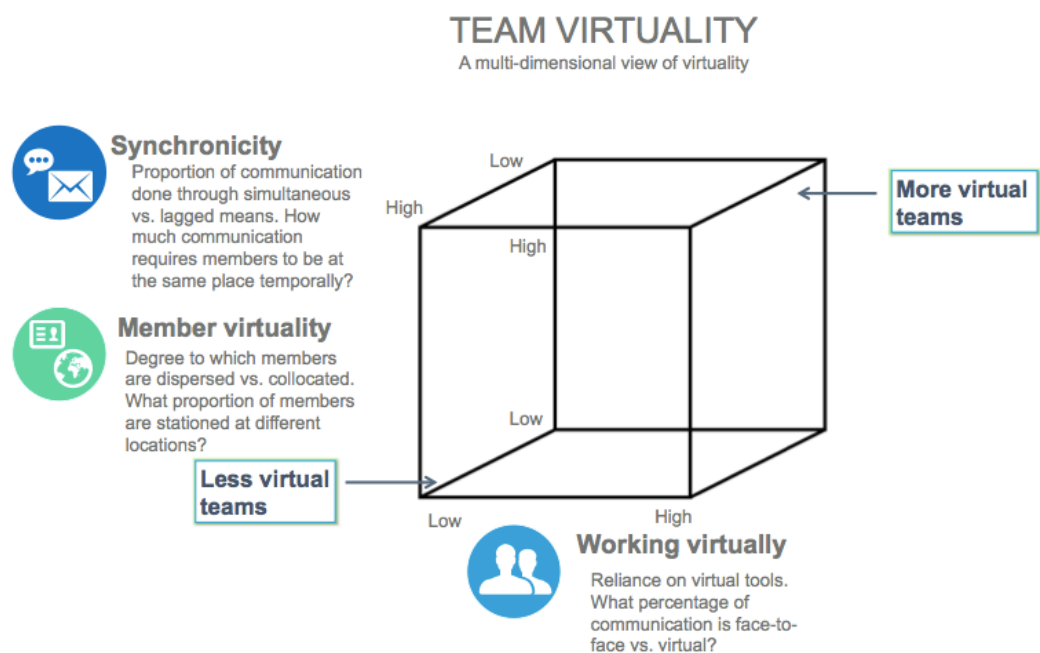


Synchronicity, member virtuality, and working virtuality all reflect different dimensions of virtuality, which can affect how virtual teams can be.

- High **synchronicity** teams tend to communicate simultaneously and be less virtual

- Teams which have greater dispersion, or higher **member virtuality**, are more virtual in nature

- Teams which rely on virtual tools are higher on **working virtually**, which makes them more virtual
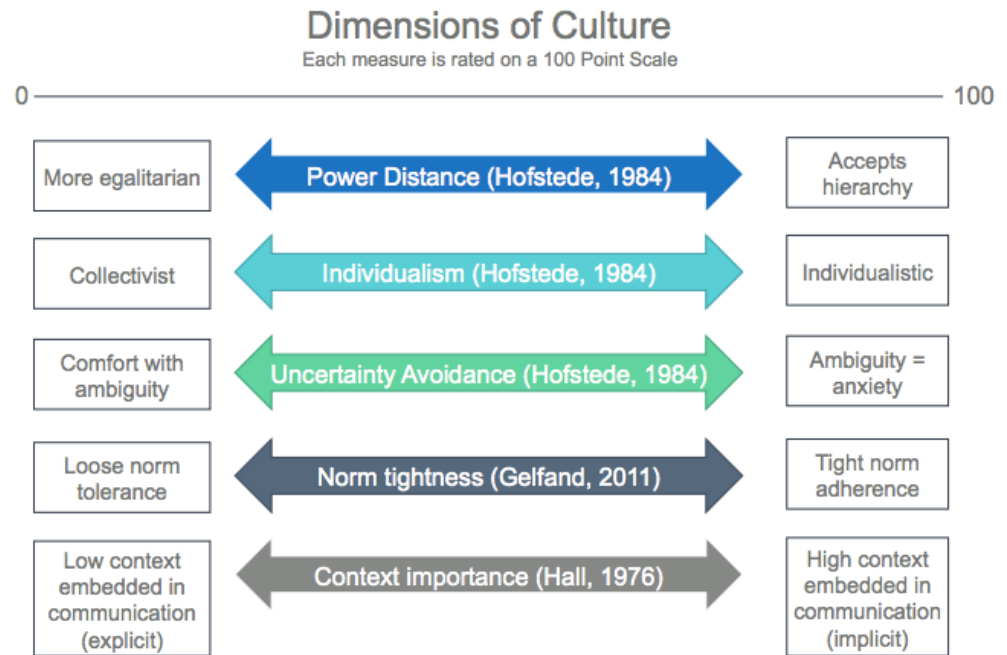
*Cultural Diversity*

Culture is a complex and multidimensional term that be framed in different levels: international, national, regional, business and organizational (Shachaf, 2008). Although there have been many attempts to define culture, there is no one exact definition. According to Kluckhohn (1951) in Hofstede (1984: 21), ―culture consists of patterned ways of thinking, feeling and reacting, acquired and transmitted mainly by symbols, constituting the distinctive achievements of human groups, including their embodiments in artifacts; the essential core of culture consists of traditional (that is, historically derived and selected) ideas and especially their attached values. According to Matondo (2012), while culture plays a significant role in how people behave, when making linkages between culture and organizational behavior, there are some important considerations in conducting cultural and cross cultural research:

1.     Culture is learned and therefore one can adapt and learn the rules of new cultures

2.     Culture is shared; therefore, group patterns can be analyzed

3.     Culture is both implicit and explicit

4.     Culture provides an understanding of orientations or a way of understanding how a particular group may respond to a certain stimulus

In addition, there are several frameworks for understanding how culture influences societies and behavior, such as Hofstede's dimensions (2001), Schein's cultural paradigms (1991) and Geertz's cultural patterns (1973).

In order to contextualize how these values operate in an organizational context, he states that members of a specific culture will have similar preferences and views of the world to people in the same culture. As a result, practices derived from one culture may not be easily adaptable to a context from another culture. In order to manage this, he uses his dimensions as a typology for how the behavior, actions, and values of the members can be analyzed. These different dimensions provide a source of variance, and as a result, cultural diversity in a group can be defined as heterogeneity of culture of individual member.

**Figure 2: Hofstede's and other's dimensions of national culture**



Together, these dimensions of cultural diversity, which are derived from Hofstede's dimensions, can help explain how teams interact with others and virtual media, how norms are perceived and enforced, and how people across cultures interact. In this paper, among many definitions of culture, we based our thoughts on Hofstede's definition of culture as "the collective programming of the mind which distinguishes the members of one group or category of people from another" (Hofstede, 1991). Hofstede suggests that based on the country of origin, national cultures lead to different behaviors, values, and norms, which affect how people behave. Therefore, the cultural dimensions developed by Hofstede represent independent preferences of behaviors that distinguishes countries from each other (Hofstede Insights, n.d). He obtained these dimensions using factor analysis. Subsequent scores were calculated through a GLOBE study, moving the level of analysis from a single company (IBM) to 1000s of organizations across the globe. The dimensions are extended to 76 countries based on the replications and extensions of the original IBM study and have been applied by many organizations and scholars.

*Hofstede's dimensions of culture on individualism and team research*

Compared to the popularity of the concept, team research using Hofstede's dimensions is relatively scant, despite the large number of citations for this seminal work (Jones, 2007). This can be due in part to the number of criticisms,

such as assumptions of cultural homogeneity (Smith, 1998) and questions of the relevance of national cultures as a unit of analysis, considering how fragmented identities may be within national borders. However, Søndergaard (1994) counters these claims by citing the substantive number and percentage of replications of the dimension and robust statistical rigor of the dimensions.

However, some team research has used individualism as a source of cultural diversity in teams. Collectivism and individualism have been proposed and used as a possible underlying variable to represent cross-cultural data (Singelis, Triandis, Bhawuk & Gelfand, 1995). This is a measure of whether people prefer to work alone or in groups. It indicates the degree of social/community integration. Some characteristics of collectivism includes maintaining harmony, interdependence, cooperation, being concern for the group's fate and prioritizing group's goal over one's own. On the contrary, individualism associates with being independent, emotionally detached from the group, accepting confrontations within ingroup, having greater concern for personal fate and prioritizing personal goal over group goal (Rhee, Uleman & Lee, 1996). Studies such as Staples and Zhao (2006) have found that diversity as measured through this index does negatively correlate with team effectiveness.

*Research on cultural diversity in teams*

Gibson et al. (2014) classified five main sources of cultural diversity, that are functional diversity, demographic diversity, faultlines, nationalities, and different cultural values. From this review classification, the majority of findings has concluded that the more culturally diverse team, the more process challenges and the lower levels of team effectiveness there are in the short run (Gibson et al., 2014). Prolonged consensus in diverse team can be very harmful in situations where quick decision making is required (Horwitz & Horwitz, 2007). Horwitz (2005) suggested that heterogeneous teams are hypothesized to be less productive and less cohesive because there are inherent tensions and relational conflict. Tyran & Gibson (2008) found that different levels of cultural diversity--surface-level and deep-level--have different effects on teams. While surface-level diversity (eg. age, tenure) has negative effect, deep-level diversity (collectivism) has positive effect on team performance.

From another perspective, Lozano & Escrich (2017) argued that the effect of cultural diversity on team performance depends on the adopted ideology

towards diversity of whether "tolerance" or "respect". The response of tolerance ideology is to adopt the *multiculturalism*, which intended to achieve only the coexistence between different groups, which might trigger perceived subgroup formation among groups. Meanwhile, the response approach for respect ideology is *interculturalism*, where organizations aspires for positive interaction, going beyond mere coexistence to positive value creating (Lozano & Escrich, 2017). Lozano & Escrich (2017) concluded that the ideology of tolerance represents the strategic interest in cultural diversity and tries to deal with it for the interest of the company, while the ideology of respect represents the moral motives and human recognition that goes before profit. This conclusion can relate to the inclusion framework by Shore, Randel, Chung, Dean, Ehrhart & Singh (2011) in different level of diversity inclusion, where inclusion is defined as the degree to which group members self-perceive as an esteemed member in the workgroup by experiencing treatments that satisfy the needs for belongingness and uniqueness (Shore et al., 2011). The *interculturalism* approach agrees with inclusion practice where individual has high value in both uniqueness and belongingness, rather than assimilation (high belongingness but low in uniqueness) or differentiation (high uniqueness but low in belongingness) (Shore et al., 2011). Therefore, the effect of cultural diversity on working groups in terms of forming subgroups are shown to be complex and dependent on several means and moderators.

*The interaction of virtuality and cultural diversity*

As previously stated, only eight studies were published between 2000 and 2013 which simultaneously examined the effects of virtuality and cultural diversity (Gibson, Huang, Kirkman & Shapiro, 2014) Since then, research has progressed and has been able to typify the effects of the interaction between cultural diversity and virtuality.

One from the eight studies that examined the effect of virtuality and cultural diversity, a study by Staples and Zhao (2006) concluded that cultural diversity reduces group cohesion and creates more conflict; therefore, leads to lower satisfaction levels for group member. However, the outcome of heterogeneous group is not any worse than that of homogeneous group (Staples & Zhao, 2006). Regarding diversity in virtual team, a study by Edwards & Sridhar (2005) also find no significant relationship between awareness of cultural diversity and the perceptions of difficulty caused by difference in time-zone and

other outcome variables. With the assumption that cultural diversity critically impacts team effectiveness, one hypothesis can be that the salience of cultural diversity is decreased in the virtual setting (Shachaf, 2008).

According to Han and Beyerlein (2016), cultural diversity's effects on virtual teams are two-fold. First, it has the potential to influence task processes and how teams work towards achieving their goals. This is influenced by four process factors: (a) task related communication, (b) coordination, (c) establishing communications, and (d) knowledge sharing. Their review of the studies find that cultural diversity can have mixed effects. For example, in asynchronous communication, while virtuality reduces surface-level attributes which can become causes of conflict such as visual cues of differences and accents and allows slower, more deliberate response times, it comes at the expense of non-verbal social context cues, which can lead to textual misunderstandings and loss of vital details which influences team processes and performance (Berg, 2012). This reveals that while virtuality and cultural diversity has significant advantages and disadvantages, understanding media choice is vital to understanding how the two interact.

Tenzer and Pudelko (2016) extended upon Dennis, Fuller, Valacich (2008) work on multi-synchronicity theory (MST) to explain the effects of multi-nationalism and language diversity on media choice. According to MST, media choices can lead to the highest performance outcomes if they are harnessed in a way that lead to mutual understanding in two core processes: (a) the conveyance of meaning and (b) the convergence of understanding. These two processes require different transmission mechanisms. While conveyance requires the transmission of large chunks of information to be processed by individuals, convergence requires a negotiation process in which harmonization of viewpoints is achieved. Due to their differences, they have different ideal media choices. For conveyance, asynchronous media is preferable because it allows for large transmissions which can be read uninterrupted. While for convergence, synchronous media is preferable because it allows individuals and teams to exchange information in order to develop mutual understanding and sense-making. Tenzer and Pudelko found that the opposite effects in multi-national, linguistically diverse teams. Synchronous media tended to lead to more cognitive overload which prevented convergence, while asynchronous media gave participants to rehearse and re-process ideas, which lead to greater convergence.

One limitation cited by the article is the reliance on Germans in the sample, this exposes an important gap: namely, the tendency of virtual team's research to leave the specific dimensions of the cultures which they are doing research upon unexamined.

Kramer, Shuffler and Feitosa (2017) illuminate our understanding of the influence of specific cultural characteristics by examining the multidimensional effects of culture on virtual teams. Their review suggests that research on how cultural diversity has been influenced by virtuality has revolved around primarily Hofestede's dimensions of culture; however, Triandis's (1995) and Trompenaar's (2011) exploration of cultural dimensions can also provide valuable insights. By combining cultural dimensions and Mathieu's framework for virtuality, they proposed that individualistic cultures will prefer asynchronous, high task-information value virtual tools, while collectivist cultures will prefer synchronous communication with high-relationship value with less virtual tools. Furthermore, dimensions such as masculinity vs. femininity, power distance, uncertainty avoidance, long vs. short term orientation, vertical and horizontal collectivism, vertical and vertical individualism, affectivism vs. neutrality, specific vs. diffuse, high vs. low context, and tight vs. loose cultures all influence the choice of electronic medium and the type of information being transmitted. This highlights the need for both an understanding of demographic diversity and also value-based diversity when analyzing virtual teams and cultural diversity.

### Subgroup Formation

Subgroups appears to be a common thread of interest in both cultural diversity and virtual team literature. As a result, this next section will explain how both virtuality and cultural diversity can be sources of perceived subgroup formation. Subgroup formation refers to emergence of smaller groups within teams, which can result in competitive, rather than cooperative relationships (Robert & You, 2015). According to Lau & Murnighan (1998), these subgroups can be caused by faultlines, which are hypothetical dividing lines that divide a team based on individual differences in race, sex, nationality, age and education background.

According to Shemla, Meyer, Greer, and Jehn (2016), *perceived diversity* or the extent to which group members are aware that others are different based on any salient dimension consists of three main focal points. The three focal points--

perceived, self-to-team dissimilarity, perceived team heterogeneity, and perceived subgroup formation reflect different research backgrounds and methodological considerations when analyzing the impact of perceived diversity on team processes and outcomes. We will focus on subgroup formation as a source of perceived diversity and therefore division.

O'Leary and Mortensen (2010), in their empirical analysis of the configurational dimension of virtuality, argue that the creation of geographically dispersed teams creates social categorization, which in turn triggers subgroups. These subgroups lead to negative effects on identification, transactive memory, conflict, and coordination problems. In addition, minority subgroups were more adversely affected by these negative effects. Furthermore, groups which had isolates or people not part of an identified geographic subgroup, did not suffer the negative effects of subgroups.

Team configurations and subgroups also affect perceptions of teams. Roberts (2016), further expanded on work which found that subgroups had differential effects on virtual and co-located teams to outcomes related to conflict, trust, coordination, identification, and transactive memory systems (Thatcher and Patel, 2012; Polzer, Crisp, Jarvenpaa & Kim, 2006; Gibson and Gibbs, 2006) and the importance of social integration in culturally diverse virtual teams (Garrison, Wakefield, Xu & Kim, 2010). He found two key findings: (*a*) virtual teams with higher racial and gender diversity perceived subgroup formation as being negatively associated with social integration, while groups with lower gender and racial diversity perceived subgroup formation as being positively related to social integration and (*b*) virtual teams with higher racial and gender diversity perceived subgroup formation as having negative effects on open team communication, while non-diverse teams perceived subgroup formation as positive for open team communication. This suggest that sub-groups are not inherently detrimental and can in fact lead to positive information sharing and positive for organizational learning (Gibson & Vermeulen, 2003); however, while supporting previous research which states that demographic based fault-lines can erode team functioning.

The mentioned findings are supported by theory which suggests that similarity in teams helps support a common identity, which helps facilitate closeness (Homan, Hollenbeck, Humprey, Knippenberg, Ilgen & Van Kleef, 2008), which in turn leads to more forgiveness towards teammate's mistakes and

positive attributions for work (Hinds & Mortensen, 2005). However, when teams become racially or gender diverse, rather than subgroups being a source of positive social support systems, they can become a perceived source of division. A possible area for consideration is to move beyond looking at demographic diversity when looking at cultural diversity and the formation of subgroups and to examine the more complex, multi-dimensional aspects of diversity listed by Kramer et al., (2017) and in the section above.

### *Team member adaptivity*

Adaptive performance, also called adaptivity (Griffin, Neal, & Parker, 2007), is also important in the chain between the culturally diverse virtual teams and team performance (Stokes, Schneider & Lyons, 2008). Adaptive performance refers to the "*cognitive, affective, motivational, and behavioral modifications made in response to the demands of a new or changing environment, or situational demands*" (Baard, Rench & Kozlowski, 2014). Adaptive performance is a kind of job performance and is synonymous with behavior that can be observed and measured in terms of individual's proficiency or contribution level (Pulakos, Arad, Donovan & Plamondon, 2000). There are several sources that trigger adaptive performance in individuals, such as economic and political instability, organizational structure and process change, included in those sources are also cultural shifts of globalization and technological advancement (Baard et al., 2014). Under the dynamic conditions created by cultural diversity and the use of technology in team-based work, individuals and work teams often find themselves needing to quickly adapt to the new working environment and job demands (Burke, Stagl, Cameron, Gerald & Halpin, 2006). Accordingly, adaptive performance has been studied in both individual level and team level research.

Several studies have suggested that adaptivity is a crucial aspect for team performance (see Baard et al. for a review), especially in diverse team (Stokes et al., 2009). Pulakos et al. (2000) presents evidence for several dimensions of individual adaptive performance, including (a) Handling emergencies or crisis situations, (b) Handling work stress, (c) Solving problems creatively, (d) Dealing with uncertain and unpredictable work situations, (e) Learning work tasks, technologies, and procedures, (f) Demonstrating interpersonal adaptivity, (g) Demonstrating cultural adaptivity, (h) Demonstrating physically oriented adaptivity. Of these, we consider demonstrating interpersonal adaptivity and

demonstrating cultural adaptivity to be most relevant in virtual, culturally diverse project teams. A key aspect of demonstrating interpersonal and cultural adaptivity is to adjust interpersonal style and successfully integrate into a new diverse team and new culture. This type of adaptivity, when shared by team members, can be a kind of group-level competence that either improves job performance (Pulakos et al., 2000) or mitigates the negative effects of different complex situations in group work, such as in virtual and diverse teams. However, the effect of interpersonal and cultural adaptivity on virtual and culturally diverse team processes and outcomes is absent.

## Research Questions and Hypotheses

Based on the literature review, we have developed 3 research questions:

1.      Do virtuality and cultural diversity in teams interact in affecting the perceived subgroup formation?

2.      Does the formation of subgroups directly affect team effectiveness?

3.      Does the interpersonal and cultural adaptivity of team members play a role in the perceived formation of subgroups?

### RESEARCH MODEL
Perceived Subgroup Formation, Cultural Diversity, Team Member Adaptability and Virtual Teams
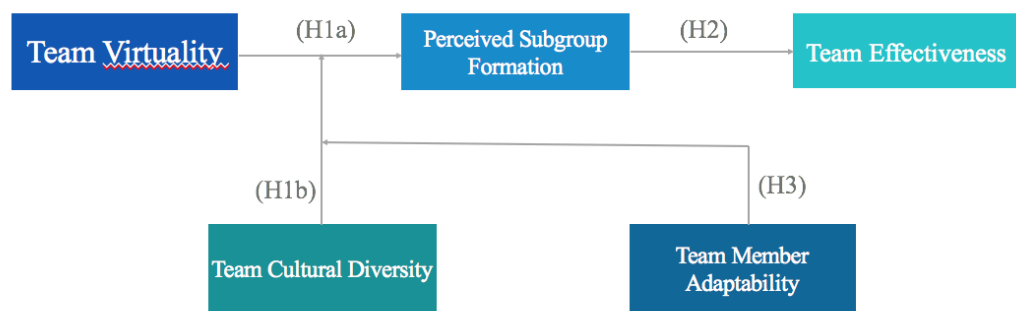


A central argument of this paper is that in virtual teams, cultural diversity and team member interpersonal and cultural adaptivity are likely to interact in relating to the perception of subgroup formation. As a result, team virtuality, cultural diversity, and team member adaptivity are indirectly related team effectiveness, while perceived subgroup formation is directly related. In the paragraphs that follow, we elaborate our hypotheses.

*The interactive relationship between virtuality and cultural diversity in relating to perceived subgroup formation*

Using McGrath's (1984) typology, research suggests that virtuality is a key input factor which influences processes, which include the perception of subgroup formation in teams. A review from Pinsonneault and Boisvert's (2001) suggests that the degree of virtuality affects key communication processes. Specifically, virtual teams tend to be more task focused in nature, which leads to less relationship-building, trust, and cohesion (Bjørn and Ngwenyama, 2010).

According to O'Leary & Mortenson (2004), team virtuality is known to trigger subgroup formation. This is caused by configurational features wherein some proportion of the team is co-located, while another proportion of the team is dispersed. As a result, teammates become categorized by whether or not they are co-located or dispersed. According to social identity theory (Tajfel & Turner, 1986), self-categorization leads to in-group and out-group biases wherein virtual teams may become characterized by favoritism towards those who are co-located and discrimination towards those who are in another site—leading to conflict, coordination issues, diminished information sharing (O'Leary & Mortenson (2010); (Wang, Walther, Hancock, 2009), (Yilmaz & Pena, 2014). For example, Yilmaz & Pena (2014) found that when both co-located and virtual teammates perform well, the contributions of the co-located team members lead to greater positive intentions and attitudes than dispersed teammates.

Furthermore, Griffith & Neale (2001) have found that co-located team members have different communication tendencies from dispersed teams. When global team are divided into subgroups with co-located and dispersed teammates, co-located teammates tend to engage in face-to-face interaction, which leads to information being communicated only to co-located members. Walther, Bunz & Bazarova (2005) found that increased relational text messaging increased trust and interpersonal liking, thus reducing the amount of subgroups and divisions within the group. As a result, we believe that due to the increased salience of geographically dispersed of virtual teams and the use of different means of virtual communication other than face to face in virtual teams would increase the perception of subgroup formation.

*Hypothesis 1a: There is a positive relationship between team virtuality and perception of subgroup formation.*

Diversity can be considered a double-edged sword due to its potential to boost performance through the diversity of knowledge and perspectives, but it also has the potential to disrupt team performance due to intergroup biases (Homan, Van Knippenberg, Van Kleef & De Dreu, 2007). According to Janssens and Brett (2006) national cultures leads to cultural precepts wherein each culture has different norms and standards for interaction which affects how individual team members evaluate others. It can affect the types of attributions individuals make towards others, which can influence team processes and functioning. For example, attributions on cultural characteristics or national identification can lead to higher perception of subgroups.

According to Harrison and Klein (2007), national diversity is the extent which team members vary in country of origin and is considered to be diversity in the form of variety. This form of diversity includes qualitative variation on a categorical attribute. According to Dahlin, Weingart & Hinds, (2005), national diversity tends to be one of the most salient traits in inter-team relationships due to its influence on communication styles, interaction patterns, and trait hierarchies. This is explained the effects of social categorization theory (Hogg & Terry, 2000), which states that people have the tendency to categorize others based on demographics and view those who are similar as superior - leading to stereotyping and distancing those not in the same group.

According to Lau and Murnighan (2005), faultlines are most likely to cause subgroups when national groups are equally split and national diversity is moderate, rather than low or high. This triggering of faultlines prevents a unitary group identity, which leads to disrupted communication, coordination, knowledge sharing, and integration (Carton and Cummings, 2012). In contrast, Kirkman, Cordery, Mathieu & Rosen (2011) found that at high diversity levels, social categorization based on national groups were less likely due to the formation of a unified community culture, while lower diversity lead to more unification of the majority group and awareness of the need to include those not within the majority group. As a result, we believe that cultural diversity will strengthen the triggering of subgroup formation at moderate levels.

Previous research suggests that both virtuality and cultural diversity influence social categorization and therefore would lead to greater salience of subgroups. According to Cramton and Hinds (2004), the greater the number of salient demographic differences, the greater the salience of subgroup formation.

Teams which are simultaneously culturally diverse (include multiple site locations) and virtual only increases the amount of differences. As mentioned in the previous section, virtuality triggers subgroups based on categorization based on differences in practices and constraints between co-located and virtual members. With the addition of cultural differences which also affect practices and constraints, we can assume that these differences become more salient and bear an even greater sense of difference in virtual teams, and therefore lead to the higher level of perceived subgroup formation.

*Hypothesis 1b: Team cultural diversity will moderate the relationship between team virtuality and the perception of subgroup formation, such that the positive relationship predicted in Hypothesis 1a will be strengthened*.

### The relationship between perceived subgroup perception and team effectiveness

Subgroups are known to have negative effects on team performance because they lead to biased information sharing and conflict. Faultlines that trigger subgroup formation prevents a unitary group identity and hinder communication, coordination, knowledge sharing, and integration (Carton and Cummings, 2012). Consequently, subgroups can be considered as a negative phenomenon for increasing conflicts between subgroups and lead to performance losses (Lau & Murnighan, 1998). Given the circumstances of virtual team, where team members are geographically dispersed, according to Lau & Murnighan (1998)'s influential study, the increased salience of differences due to virtual sites leads to self-categorization. In virtual teams, co-located vs dispersed members experience different events, physical settings, working hours, settings, and practices, which can affect how people categorize themselves (Cramton and Hinds, 2004). A study by Cronin, Bezrukova, Weingart, & Tinsley (2011) proposed that the effect of subgroup formation on team satisfaction would be mediated by affective integration and cognitive integration. The result suggested that subgroup formation hinders the affective integration among team members which lower team member satisfaction as well as fails to motivate team member knowledge sharing in cognitive integration due to the lack of understanding among team members (Cronin et al., 2011). Team member satisfaction and team knowledge/information sharing process are important in providing team outcome, therefore, we propose that team effectiveness would decrease when perception of subgroup formation is high.

*Hypothesis 2: Perception of subgroup formation is negatively related to Team effectiveness*

**The moderating influence of interpersonal and cultural adaptivity on the perception of subgroup formation in virtual and culturally diverse teams**

According to Yilmaz & Pena (2014), although demographic differences can lead to the perception of subgroup formation, the perception of subgroups can be reduced by interpersonal behaviors. For example, how the team perform will affect the extent in which people view themselves as part of a team or subgroup. In addition, research on cultural competence in virtual teams with subgroups indicates that teams where people were able to show openness and perspective taking by adapting and learning from their environment were able to perform more effectively. This indicates a clear link between the ability to adapt and avoid the negative effects of subgroup formation. Adaptivity enables team member to evaluate the environment of high or low cultural diversity and adjust operations accordingly (Randall, Resick and Dechurch, 2011). We would propose that the level of team member adaptivity would affect the perception of subgroup given the level of cultural diversity observed in virtual teams. The detailed matrix proposition is shown in table 1.

*Hypothesis 3: Team member's interpersonal and cultural adaptivity moderates the relationship between team virtuality, cultural diversity and perception of subgroup formation such that the positive relationship predicted between these variables in Hypothesis 1b will be reduced when team member adaptivity is high.*

*Table 1. Predicted triple interaction effects of team virtuality, cultural diversity and team member adaptivity on perceptions of subgroup formation*

| | | CULTURAL DIVERSITY | |
| --- | --- | --- | --- |
| | | **High** | **Low** |
| **TEAM MEMBER ADAPTIVITY** | **High** | Perceptions of subgroup formation is less prominent than in the High Cultural Diversity, Low Team Member Adaptivity category | Low perceptions of subgroup formation |
| | **Low** | Highest perceptions of subgroup formation | Lowest perceptions of subgroup formation |

# Methods

## *Procedure, Sampling and Participants*

Survey data was obtained in two rounds. First, we used snowball sampling in an attempt to collect team-level data. From our personal network, we sent the survey to either team leader or team member working in different organizations where there are virtual working teams. We asked them to distribute the survey to the whole team. For some teams, we received participation of more than one team member while for the majority of teams, we received answer from only one member. Next, we used Mechanical Turk, an Amazon service in order to recruit participants electronically by offering a small monetary reward for participation to collect more individual data. We included a manipulation check where respondents were required to enter their team location data in an open-ended response box. Responses which failed to give data which pertained to a location where eliminated as faulty. This resulted in a reduction from 250 to 174 responses. In addition, respondents were given a code upon completion of the survey in order to receive credit for responses. In total, we received 174 qualified responses based on our criteria, consisting of employees who work with team members across multiple work sites, both nationally and internationally.

*Table 2. Individual and team sample information*

|  | Respondents (N = 174) |
|---|---|
| **Virtual Teams** (with more than one survey respondent) | 7 virtual teams<br>n = 20 |
| **Individuals Working in Virtual Team** | n = 154 |

The survey designed to collect data for virtual teams is slightly different from the survey for individuals working in virtual team in order to sort the responses of the same team together. In the survey used for virtual teams, we have questions asking participants to think of a particular virtual team that they are working in and providing answers for team sorting. The teams are sorted by either the name of the survey distributor or by the team name provided to our survey distributor. Those responses with the same name of distributor and/or team name are grouped into one team response. We can also check for the exact team

response by the answer for the team member locations. Whereas in the survey for individuals working in virtual teams, we only provide a note asking them to think of one specific virtual team while answering the questions without having to sort out the team.

*Individual participant descriptives*

Participants are members of working teams that use virtual means of communication next to face-to-face interaction for group works. The gender split is fairly even (42% female). The two largest groups in terms of country of origin were people born in the USA (38%) and in India (30%) providing variance of surface-level diversity.

*Figure 3. Number of Participants from Country of Origin*
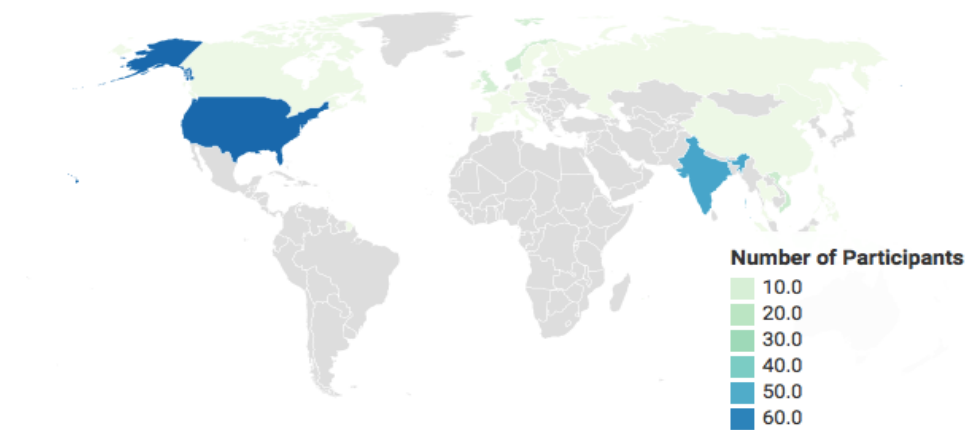
**Participants Country of Origin**



*Figure 4. Average ages and index scores of participants*
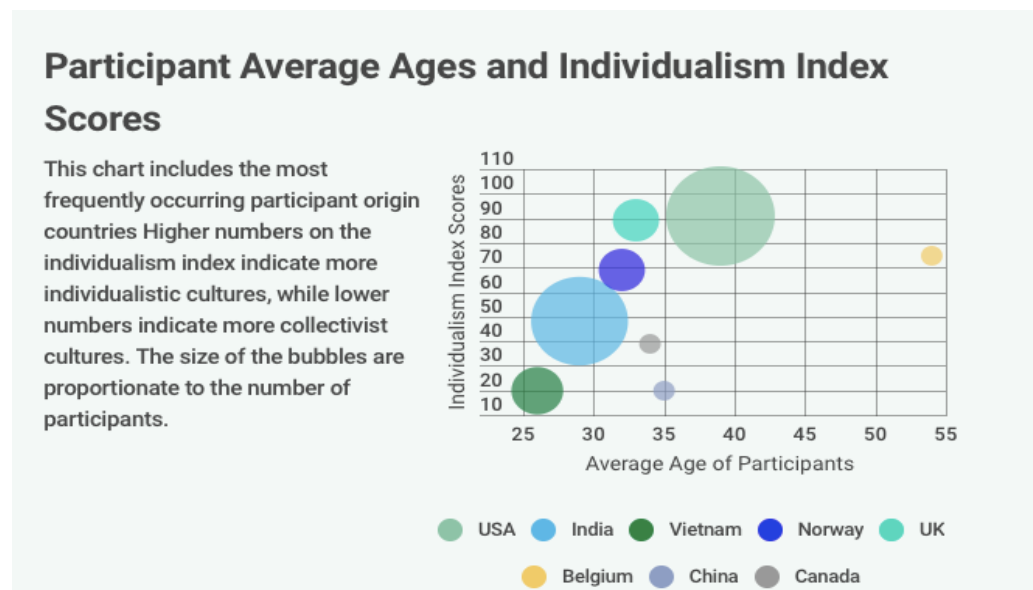
In addition to participant data, we also collected data with regards to the teams in which participants were part of.

*Figure 5. Proportion of International vs. Domestic Teams*
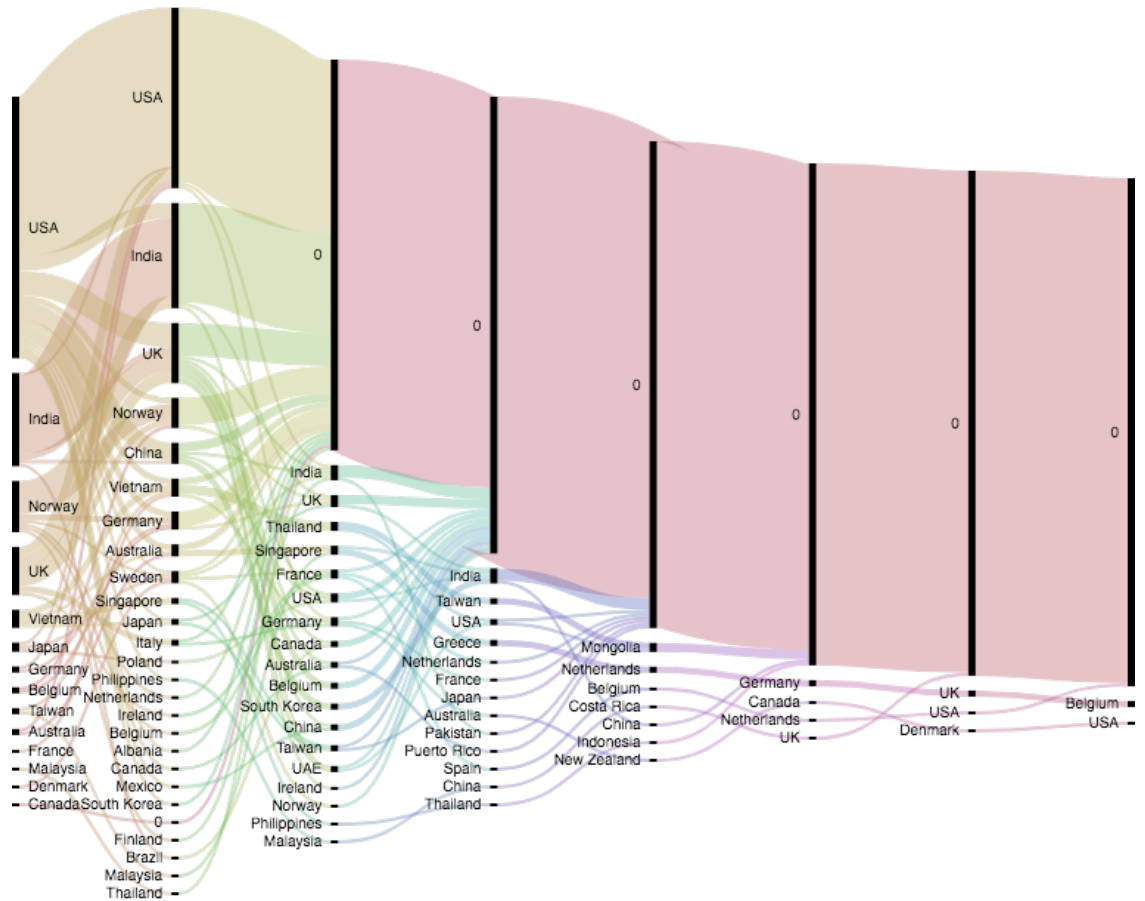


This alluvial indicates the proportion of international vs. national teams. The black lines indicate the number of teams in each country, while the colored lines indicate connections between different locations (ie. the brown color corresponds to USA, which has connections to numerous countries). Nodes which are connecting to zero indicate that there are no further connections. Consistent with the demographics of our sample, most sites were either in USA or India. For descriptive purposes, domestic teams in India and USA, were listed as a second site. Teams comprising of only domestic sites composed 56% (n=94) of our sample. Despite this, 53% (n=91) of our participants reported that their teams were located in 3-5 sites, which indicates that multiple domestic sites may be numerous. When all teams were aggregated, the average member virtuality was 87.23, indicating that for each team site (domestic and international) there was less than one member, which indicates that there is some transience in terms of how people work (i.e. virtual teams may consist of people who both work in an

office and from home). Due in part to the substantial presence of teams comprising of locations in only one country, the average difference in individualism scores amongst the whole sample was 1.25 (SD=.509) indicating low diversity.

*Figure 6. International Team Connections*
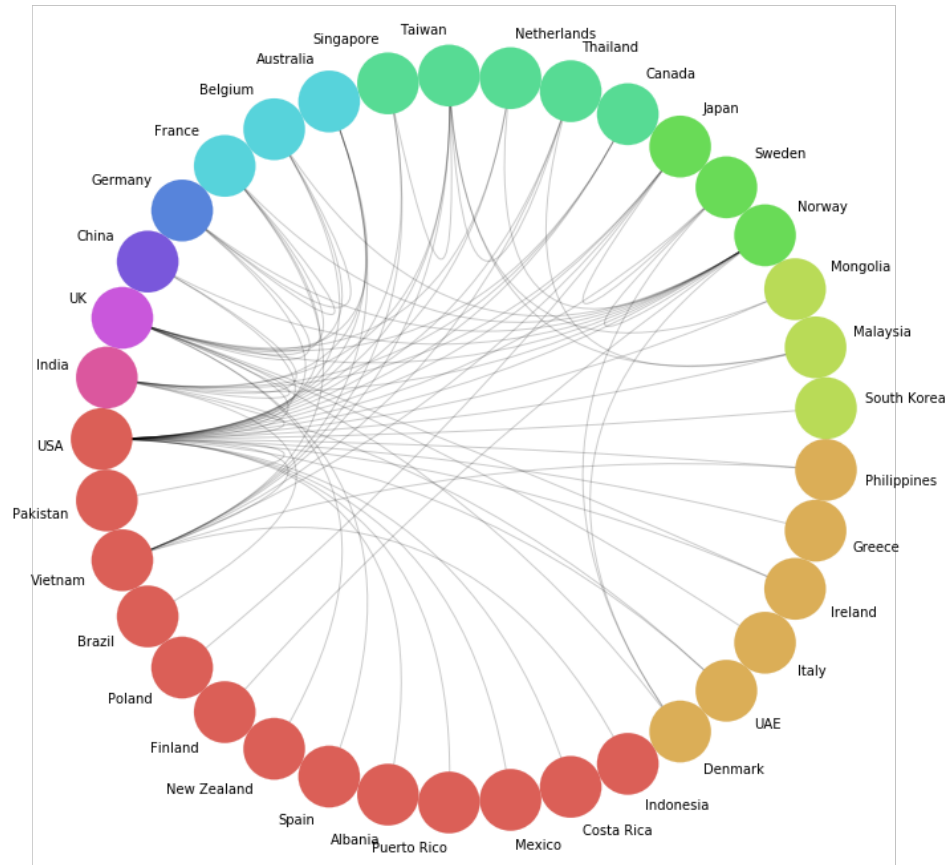


This map depicts all of the countries represented in team locations and the frequency of connections between countries. USA, UK, India, and Norway were the most "interconnected" countries and represented the largest proportion of locations. USA-UK, UK-India, and USA-India team configurations were amongst the most common. Teams with members located in Norway tended to connect to multiple team locations, rather than forming two-country dyads. Of the international teams, the average difference in individualism was 1.67 (SD=.672), indicating that on average the international teams had between low and medium amounts of diversity.

*Measures*

*Virtuality*

As stated by Kramer et al. (2017) virtuality is a multi-dimensional construct. As single dimension measures do not encompass the entire construct, we collected data for the purpose of creating several measures, including:

*Proportion of time working virtually (WV)*. This variable represents the proportion of time spent working through virtual means and is an indicator of electronic dependence for communication. Based on Duxbury and Schweitzer's (2010) measurement, we asked participants what percentage of time they spent communicating through various means and calculated the proportion of time spent virtually vs. face-to-face.

$$WV = 100 - percentage\ of\ time\ spent\ working\ face\ to\ face$$

*Proportion of time spent working asynchronously (WA)*. This variable represents the amount of time communicating through simultaneous communication vs lagged communication. This scale was developed by Mathieu and Kirkman (2006). Asynchronous communications are communications which are used when members work in different time zones and are unable to communicate at the same time. In contrast, synchronous communications involve simultaneous communication. According to Mathieu and Kirkman, teams which are more asynchronous are more virtual. This measure calculated based on the proportion of communications used which were virtual versus asynchronous. We evaluated communication mediums as asynchronous or synchronous based on Holahan, Mooroney, Mayer, and Finnery (2014)'s media synchroncity systems.

| Synchronous | Asynchronous |
|---|---|
| Face-to-face | Group conversations on social network platforms |
| One-to-one telephone conversations | Email (individual and group) |
| Video voice conference | Written reports |
| One-to-one instant messaging | |
| Group chat (Slack, Google Hangout, Lync, etc) | |

$$WA = 100 - percentage\ of\ time\ using\ synchronous\ communication$$

*Member virtuality*. This variable refers to the degree to which team members are dispersed (Schweitzer and Duxbury, 2010). This can be thought of as the proportion of members at different locations. Like the other measures, it is a continuum which suggests that the proportion of members at different locations indicates higher virtuality. This was calculated using the number of locations divided by the number of members x 100 based on data reported by the participants, where they indicated the number of members they had on their team and the number of team sites.

$$\frac{number\ of\ locations}{number\ of\ members} * 100$$

*Cultural diversity*

In the survey, participants were asked to provide their nationality and location of themselves and their team members. Their location data was then used to create a team diversity score, using Hofstede (1991)'s dimension of individualism. Although all dimensions of culture affect how people interact and influence behavior, individualism is considered an important influence on team behavior. According to Kramer et al. (2017), cultures with high scores on individualism will prefer asynchronous communication with high value information, while collectivist cultures which emphasize group harmony will prefer synchronous communication, with high relational information. Staples and Zhao (2006) found evidence that this diversity in this dimension leads to less cohesion and satisfaction, and more conflict in virtual teams. We use the data of the country means of individualism dimension provided on the Hofstede Insights website (https://www.hofstede-insights.com/) which is available for 76 countries. All participants' nationality and location on our survey falls in the 76 data available countries. With the country individualism score and the country compositions of teams, we can calculate the mean individualism score for that team.

The team diversity was variable created based on a calculation of the team's standard deviation with regards Hofstede's individualism index. Specifically, each participant reported their own nationality and the countries in which their virtual team members were based. We computed the standard

deviation of these countries' scores on the individualism index. A standard deviation of less than 20 was coded as 1 = low diversity, a standard deviation between 20 and 39 was coded as 2 = medium diversity, and a standard deviation of 40 and over was coded as 3 = high diversity, in line with Staples & Zhao (2006).

Note, this treatment was not attempting to identify teams that were high or low on the individualism index. The purpose, rather, was to identify teams with members that had similar cultural values (i.e. low diversity) with regards to individualism/collectivism and teams with members that had different cultural values (i.e., high diversity) with regards to individualism/collectivism. We used Staples and Zhao's methodology in order to assure that the classification of teams in this manner reflected a significant differentiation of diversity. The average standard deviation for the low, medium, and high diversity teams were 3.441 (standard deviation of 4.78), 29.98 (standard deviation of 4.59) and 47.2 (standard deviation of 5.04), respectively. An ANOVA test for statistical significance and difference in means showed f-value (2, 171) of 595.82 and p-value of < .0001, indicating that the creation of the low, medium, and high diversity teams on this dimension was successful.

*Subgroup formation*

Because we are looking at subgroup formation, rather than the presence of subgroups, we decided to use items related to faultline strength. Faultlines are the demarcations which eventually cause the formation of subgroups. By using items measuring perceived faultline strength, we were able to measure how people perceive the root causes of subgroups, and therefore obtain a sense of how people perceive how subgroups are formed. According to Jehn, Greer, Levine & Szulanski (2008), faultlines can be objective based on the demographic features of the team; however, their effects are more negative when they are perceived. This study uses 6 items from Jehn and Bezrukova (2006) to measure perceived faultline strength on a 1-7 point agreement scale (1=strongly disagree, 7 = strongly agree). See Appendix 1 for items.

*Team member adaptivity*

In the scope of our paper, we focus Team member adaptivity was measured using two 5-item scales, based on descriptions of interpersonal adaptivity and cultural adaptivity provided by Pulokos et al. (2000). Responses

were given on a 7-point Likert-type agreement scale (1=strongly disagree, 7 = strongly agree). (See Appendix 2 for items)

*Team effectiveness*

The assessment of team effectiveness followed Hackman's (1987) three criteria of effective work teams (Thomas, 1999). First, the outcome of the group should at least meet or exceed the requirements for quantity and quality as set in the objective of the project. Second, personal needs during the group work should be met during the group experience. Third, the interactive social processes that allow the team to function should maintain or enhance the capability of team members to cooperate. The first criterion suggests the tangible team task objective performance, while the other two criteria suggest intangible members' satisfaction and group integration process. We added a fourth criteria to the measure of team effectiveness that measured individual member satisfactory on decision making process. These were each measured by a single-item measure. (See Appendix 3 for items)

### Control Variables

We collected data on several demographic and team related variables such as team size, team tenure, member familiarity, and age of the members in order to have better descriptive of the sample and also to reduce the chance of results being attributable to spurious relationships. From the demographic data, we use team tenure as the control variable since team tenure is believed to affect individual perceptions of the team's psychological safety environment (Koopmann, Lanaj & Zhou, 2014) and hence influence the perceived subgroup formation and team effectiveness. Many virtual diverse teams work on project-based tasks, therefore, we classify team tenure as the time the team has been working together such that, 1 = Less than 3 months; 2 = 3-6 months; 3 = 6-12 months; 4 = More than 1 year based on a measure from project management cycles (Kerzner & Kerzner, 2017).

## Analysis

An exploratory principal component analysis (PCA) with promax rotation was first performed on all multiple scale variables to determine item retention. We only include items that satisfy having loading of 0.5 or higher on the target

construct (Nunnally and Bernstein 2007), with a cross-loading of less than 0.35 on other included factors (Kiffin-Petersen and Cordery 2003) and a differential of 0.2 or higher between the included factors (Van Dyne, Graham and Dienesch 1994).

We check the scale reliability of the Likert scale questions using Cronbach's alpha, taking the α score of 0.7 or higher. Several new variables are created by computing the mean score, such as for perception of subgroup formation (PSG), Interpersonal adaptivity (IA) and Team effectiveness (TE).

The hypotheses were then tested using SPSS for linear regression modeling. To test H1a, the dependent variable (Perception of subgroup formation PSG) were regressed onto the independent variables (Team virtuality, measured in three ways) in separate models. To test H1b, containing Team Cultural Diversity as a moderator in the relationship between team virtuality and perception of subgroup formation, hierarchical moderated regression (Cohen and Cohen, 1983) modeling was used. We create the interaction terms of cultural diversity and three measures of team virtuality by centering the independent variables before multiplying them (Aiken and West, 1991). The dependent variable (PSG) was regressed onto the independent variables (Cultural diversity, measures of team virtuality, and the interaction team between cultural diversity and team virtuality) in separate models. H2 is tested by regression analysis with the dependent variable (Team effectiveness) regressed onto the independent variable (PSG). H3 pertain to the moderating effects of interpersonal/cultural adaptivity on the relationship between team virtuality, cultural diversity and perception of subgroup formation. Accordingly, the steps for hierarchical moderated regression are similar to testing H1b.

## Results

### *Principal component analysis*

The principal component analysis found a clean factor structure with three factors, with team effectiveness, perceived subgroup formation, and interpersonal adaptivity showing loading of 0.5 or higher on the target construct (Nunnally and Bernstein 2007), with a cross-loading of less than 0.35. The principal component analysis (see Appendix 4) of self-reported measures for team effectiveness items revealed that all 4 measures loaded onto a single factor, with loadings above 0.5.

Therefore, team effectiveness scale was computed with all the four items.

The principle component analysis also showed that all five measures of interpersonal adaptivity (IA) loaded onto the target factor, with all loadings above 0.5. Accordingly, the IA scale was computed with all 5 items. Similarly, all of the 6 measures of perceived subgroup formation (PSG) loaded onto the target factor, with loadings above .50. The scale for PSG was computed with these six measures.

Table 3 reports the means, standard deviations, and bivariate correlations for all variables. In parenthesis, the coefficient alphas indicating scale reliabilities are reported for all computed scales.

*Table 3. Descriptive statistics, correlations, and scale reliabilities*

| | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| **1. Team Tenure**[a] | 2.28 | 1.03 | | | | | | | | |
| **2. WV** | 84.3 | 18.4 | .101 | | | | | | | |
| **3. WA** | 49.9 | 21.7 | .013 | .485** | | | | | | |
| **4. MV** | 87.2 | 46.7 | -.225* | .066 | .319** | | | | | |
| **5. CD** | 1.21 | 0.50 | .028 | .041 | -.104 | .051 | | | | |
| **6. IA** | 5.89 | 0.74 | -.058 | .004 | -.036 | -.001 | .225** | (.881) | | |
| **7. PSG** | 4.30 | 1.43 | -.151* | -.041 | -.006 | .271** | .019 | -.131 | (.884) | |
| **8. TE** | 5.82 | 0.81 | -.021 | -.066 | -.128 | -.027 | .195* | .570** | -.103 | (.785) |

$N = 174$; **coefficient alphas** indicating scale reliabilities are in parentheses; correlations marked with * are **significant** at the 0.05 level and those with ** are **significant** at the 0.001 level.

[a] How long has this team been working together?

1 = Less than 3 months

2 = 3-6 months

3 = 6-12 months

4 = Longer than a year

**WV** = working virtually; **WA** = working asynchronously; **MV** = member virtuality; **CD** = cultural diversity; **IA** = interpersonal adaptivity; **PSG** = perceived subgroup formation; **TE** = team effectiveness

### *Regression and interaction analysis*

Table 4 reports the regression results used to test the models for hypotheses H1a,

H1b and H3 by modeling the direct and indirect relationships between team tenure, team virtuality, cultural diversity, and interpersonal adaptivity with perceived subgroup formation.

*Table 4. Regression results*

| | Perceived Subgroup Formation | | | |
|---|---|---|---|---|
| Variables | $\beta$ | R | R-Squared | F |
| **Step 1** | | .233 | .054 | 5.345 |
| • **Team Tenure** | -0.233* | | | |
| **Step 2 (H1a)** | | .107 | .088 | 5.527 |
| • **Team Tenure** | -0.18 | | | |
| • **Member Virtuality (MV)** | 0.236* | | | |
| **Step 3 (H1b)** | | .124 | .095 | 4.305 |
| • **Team Tenure** | -1.95 | | | |
| • **Member Virtuality (MV)** | 2.24* | | | |
| • **Cultural Diversity (CD)** | 1.33 | | | |
| **Step 4 (H1b)** | | .130 | .091 | 3.348 |
| • **Team Tenure** | -2.01* | | | |
| • **Member Virtuality (MV)** | 2.23* | | | |
| • **Cultural Diversity (CD)** | 1.38 | | | |
| • **CD x MV** | 0.737 | | | |
| **Step 5 (H3)** | | .175 | .128 | 3.767 |
| • **Team Tenure** | -0.208* | | | |
| • **Member Virtuality (MV)** | 0.223* | | | |
| • **Cultural Diversity (CD)** | 0.194 | | | |
| • **CD x MV** | 0.08 | | | |
| • **Interpersonal Adaptivity (IA)** | -0.22* | | | |

| | β | | | |
|---|---|---|---|---|
| **Step 6 (H3)** | | .187 | .122 | 5.344 |
| • **Team Tenure** | -0.209* | | | |
| • **Member Virtuality (MV)** | 0.222* | | | |
| • **Cultural Diversity (CD)** | 0.195 | | | |
| • **CD x MV** | 0.081 | | | |
| • **Interpersonal Adaptivity (IA)** | -0.223* | | | |
| • **IA x MV** | -0.018 | | | |
| **Step 7 (H3)** | | .433 | .187 | 2.865 |
| • **Team Tenure** | -0.218* | | | |
| • **Member Virtuality (MV)** | 0.213* | | | |
| • **Cultural Diversity** | 0.194 | | | |
| • **CD x MV** | 0.087 | | | |
| • **Interpersonal Adaptivity (IA)** | -0.247* | | | |
| • **IA x MV** | -0.031 | | | |
| • **IA x CD** | 0.115 | | | |
| • **IA x CD x MV** | -0.218 | | | |

Note:

$β$ are standardized beta

* p <.05. **p <.01. ***p< .001.

*H1a*: The direct relationship hypothesis (H1a) predicted a positive relationship between team virtuality and perceptions of subgroup formation. The regression analysis revealed that team virtuality was positively related with perceived subgroup formation when measured as member virtuality, while the other measures, working virtually and team synchronicity, did not show a statistically significant relationship. The coefficient value $β$ = .23, $p < 0.05$ (Table 4) suggests significant relationship between team virtuality (member virtuality) and perceived subgroup formation. Accordingly, these findings provide full support for hypotheses 1a.

*H1b:* According to Baron and Kenny (1986)'s assumptions for moderation, a moderated relationship requires a relationship to exist between the

independent and dependent variables, which in this case are team virtuality and perceived subgroup formation. Since member virtuality (MV) was the only measure of team virtuality which showed a positive relationship with perceived subgroup formation, the other measures, working virtually and team synchronicity, will be dropped from the moderation analysis. The moderation hypothesis (H1b) predicted that the relationship between team virtuality and the perceived subgroup formation would be moderated by team cultural diversity, as measured by differences in degree of individualism. The results in Table 4 reveal that moderation did not occur, nor were there any interaction effects.

*H2:* Hypothesis H2 predicted a negative direct relationship between perceived subgroup formation and team effectiveness. The regression analysis revealed that while the direction was negative ($\beta$ = -.109), as expected, it was insignificant (p=.160), indicating that there was no support for this hypothesis.

*H3:* Our third hypothesis predicted that interpersonal adaptivity will moderate the relationship between team virtuality, team cultural diversity, and perceptions of subgroup formation, such that positive relationship predicted between these variables in H1b will be reduced when interpersonal adaptivity is high. Similar to H1b, we did not find statistically significant evidence of moderation; however, we did find that IA has a negative relationship with PSG in some models, as shown in Table 4.

## Discussion

Our thesis attempted to synthesize research on cultural diversity and virtuality in order to create an integrated model for understanding how cultural diversity and virtuality are related to team effectiveness. We proposed that the cultural diversity, virtuality, and team adaptiveness interact and are indirectly related to team effectiveness through perceived subgroup formation, which is directly related to team effectiveness. We found support for a positive relationship between vitruality, as measured as member virtuality (value $\beta$ = .23, $p < 0.05$), and perceived subgroup formation. However, we did not find support for the relationship between perceived subgroup formation and team effectiveness. In addition, none of our proposed interaction effects between cultural diversity, virtuality, or interpersonal adaptivity occurred.

Our control variable team tenure showed a statistically significant relationship with member virtuality (p-value .026; r =.225), perceived subgroup

formation (p-value .049; r = -.151), which suggests that the longer team members work together using virtual means, the team becomes more virtual and lessen the perceived subgroup formation. This relationship can be explained by individual-level construct of trust that based on positive outcomes of repeated behaviors, individual gradually develop trust over time (Robert, Dennis & Hung, 2009). This result suggests that in team where members are highly dispersed and member have less synchronous interaction, the perception of subgroup is higher. However, when the team has been working together over time, the repeated and constant interactions in group may help forming trust among team members who are geographically dispersed, therefore helping to lessen the perception of subgroup formation. Robert et al., (2009) suggest that geographical dispersion or member virtuality may introduce organizational perception that limit information that team members base on to decide over trustworthiness of other team members and ICT means of communication also slow down the process of trusting relationship in virtual teams.

Our study ran contrary to published studies on the relationship between cultural diversity, perceived subgroup formation, and team effectiveness (Roberts, 2016). This can be partially attributed to differences in our measures, sample, or model. We will discuss potential issues in depth in this upcoming section.

*Model*

The results of the model ran contrary to Roberts (2016), which found that the effects of perceived subgroup formation's effects on team effectiveness were moderated by racial and gender diversity. Our study did not find evidence that perceived subgroup formation was a predictor of team effectiveness nor did it find that cultural diversity moderated the effect of perceived subgroup formation on team effectiveness. Instead, we found that interpersonal adaptivity had direct effects on team effectiveness. However, when cultural diversity and virtuality were added to the model as either moderators, independent variables, the explanatory power of the model (f-value) did not increase. This implies that the effects of team level cultural diversity and virtuality on team effectiveness are marginal, compared to individual interpersonal adaptivity. As a result, further models may try to re-examine how these variables are positioned and the extent which individual heterogeneities should be placed in the model compared to team level characteristics.

*Method and Sample*

In addition to the model, there may be differences with the methodology which may have accounted for the differences in results.

As stated previously, this study varies in terms of methodology from similar explorations of the effect of virtuality and cultural diversity on teams because it is cross-sectional, rather than experimental. One benefit of cross-sectional methods is that ecological validity is increased because the teams in question more closely resemble how they operate in reality. Based on our sample, virtual teams are incredibly diverse with virtually no team reporting identical proportions in which communication tools they used and how often they used them. In addition, except for the domestic teams, there was significant heterogeneity in the countries represented and their differences in cultural values. As a result, the generalizability of some of these experiments which used pre-determined team compositions and communication medias may be questioned.

However, experiments do have greater accuracy in measures, which may increase validity (Lindell & Whitney, 2009). Because we were obtaining team-level data for measures such as cultural diversity and virtuality through self-report data from individuals, our data collection for these measures may have been affected by self-report bias and mono method bias. Self-report bias is what Donaldson and Grant-Vallone (2002) refer to as measurement inaccuracies, which have turned into systematic biases due to their tendencies. This can be due to social desirability, inability to remember, or the state which the person was in when taking the survey. According to Donaldson and Grant-Vallone, this is particularly problematic in organizational research because employees tend to believe that this type of research may have consequences on their work life. This may be somewhat problematic to our study because several of our surveys were distributed to team members by their leaders and members were encouraged to enter potentially identifying team level data, which may have affected the willingness to be honest about perceptions of team effectiveness. As a result of these issues with self-report bias, Borman, White, Pulakos, Oppler (1991) found that peer and supervisor reports tended to be more accurate than self-reports. This may be particularly problematic for our interpersonal adaptivity and subgroup formation measures, which tend to reflect socially desirable biases.

This problem is further compounded by our mono-method design, which can lead to common method variance which Lindell and Whitney (2001) refer to

as variance due to the method of measurement, rather than the construct itself. We believe that our study is particularly vulnerable to this because of its reliance on being able to take surveys online, which may have variances in ability. For example, several participants had difficulty entering the percentage of time using various online communication channels so that they added to 100. This might reflect that the measurement instrument for this construct measures computational ability as well.

In addition, our study was affected by sampling bias. Because we relied heavily on MTurk's service, we were beholden to where Amazon was most prevalent. Due to variations in payment policies, Amazon's pool of workers tend to be predominately American and Indian, which resulted in or sample being 67% Indian or American. This results in sampling bias in the form of a specific real area (Kahneman & Tversky, 1972) meaning that our sample is not reflective of the general population. This lead to skew in our distribution of teams. Our sample was roughly evenly divided between domestic and international teams, which lead to skew in the proportion of the level of diversity of teams. As a result, teams which had low degrees of difference in cultural values were overrepresented in the sample--comprising of 76% of the sample. As a result, while this may resemble the distribution of diversity within a general population, for the purpose of this experiment, we believe that sample which reflected greater heterogeneity or at least a normal distribution of heterogeneity may have resulted in different results. This is potentially particularly problematic for our study because we found that higher levels of cultural diversity were associated with interpersonal adaptivity, which means that the strength of these results may be put into question.

### *Measure and Construct*

Our contrary results may also be partially attributable due to our choices of measurement and whether or not they are the most accurate way of measuring the constructs which underlied our model.

One of our key variables was cultural diversity as measured by national cultures. As previously noted, the use of these dimensions has many criticisms, such as this approach neglects organizational culture variance. Researches have suggested that corporate or organization culture can modify the behavior associated with national culture (Shenkar, 2001). In addition, national cultures are complex and according to Hofstede, although they represent patterns of difference

in behavior, they are learned behaviors which change based on the environment and where a person is located. We found that because globalization often involves relocation, team members may be located in a place other than their origin. For example, for many of the Indian members of our sample, their place of location has radically different scores on the individualism index than their place of origin (i.e. the difference between individualism scores between India and UK is 47). Based on the assumption that team members would adapt to their local culture, we calculated cultural diversity based on member locations; however, the extent which this is true is affected by several factors such as how long they have been in that culture, how willing they are to adapt to that culture, and how isolated they are. Because we did not collect data on how long each participant was located in their work country, we do not have much of a way of understanding the extent that certain participants have adapted to their local culture.

When cultural diversity was measured based on member origins, we found slightly different means and distributions of low, medium, and high diversity teams. Although the relationship between cultural diversity and perceived subgroup formation remain non-significant and there were no interaction effects found when we used a measure of cultural diversity based on member origin, we believe that some variance within this construct is unaccounted for due to our choice of measure.

### *Limitations*

As previously discussed, due to availability of data, this study uses an individual level, rather than team level analysis. Virtually all of the constructs we have measured can be analyzed in terms of a team level analysis, which affects the complexity of our experiment. According to social information processing theory (Salancik and Pfeffer, 1978), people' attitudes and perceptions are affected by the social information they've obtained about how others think. Consequently, how individuals think is shaped by the information obtained from the social environment—particularly the immediate team environment. As a result, we believe because individual team members gain and use social cues from their team in order to interpret the nature of subgroup formation and virtuality, missing team level data negatively affects our study. For example, with team-level data, we would be able to understand how individual perceptions of interpersonal adaptiveness affect team level perceptions of subgroup formation and how team-

level perceptions of subgroup formation affects team-level perceptions of team-effectiveness.

According to Lee, Kwon, Shin, Kim and Park (2017), team level conflict can influence team effectiveness and satisfaction. Although we do not directly measure conflict, we measure one of its antecedents with items which measure subgroup formation such as, *"If one or more team members were omitted from our team, it would be much easier to finish this project"*. Further, although the subgroup formation scale reflects that the formation of subgroups may be a source of conflict, it does not distinguish between task and relational conflict. According to Lee et al. (2017), relational and task related conflict have differentiated effects on team effectiveness. Further, there is a cross-level interaction effects between individual-level task conflict and team level task conflict, which in turn influences team effectiveness. In light of this, this study fails to examine a couple things. First, it does not capture whether or not virtuality and cultural diversity are important driving factors in subgroup formation due to their effects on tasks or relations. Next, it does not provide an account of how team level perceptions of subgroup formation affects individual level perceptions of subgroup formation and how the relationship between the two affect team effectiveness.

We proposed in the study that adaptive performance would moderate the negative relationship between subgroup perception and team effectiveness and used two specific dimensions of interpersonal adaptivity and cultural adaptivity as the measures. However, the two measures are subjectively assessed and received mostly high level of adaptivity. There have been studies that present the importance of considering both self-ratings and other ratings to measure outcome of effectiveness (Atwater, Ostroff, Yammarino & Fleenor., 1998; Amundsen & Martinsen, 2014) and this study did not take into account the more objective of others' valuation in adaptivity of individuals. The overestimation of self-rating brings the lowest effectiveness (Atwater el al., 1998) and reported lower job satisfaction and higher turnover rate for those people they work with (Amundsen & Martinen, 2014). Therefore, in order to measure more accurately adaptive performance as a competence, it should be measured both subjectively and objectively. Furthermore, these two measure of adaptivity can correlate with other dimensions of adaptive performance such as handling work stress and learning (Pulakos et al., 2000) that may affect the overall adaptive performance of individuals.

*Implications*

First, some of the most powerful practical implications from this study come from its demography and descriptives. It provides evidence that virtual teams have immense variability in terms of locations, people, and diversity. In terms of cultural diversity, almost no international team is completely identical, which provides evidence to the assumption that work is becoming increasingly complex and globalized. As a result, our study indicates that learning to adapt to one or some cultures is not sufficient, as indicated by the positive association between team effectiveness and interpersonal adaptivity. Consequently, rather than focusing on team-level traits such as cultural differences and virtuality, attention should be paid to the individual team members and the types of competencies they possess.

This has practical implications for the type of competencies which are required for modern virtual teams. Rather than experience working with teams with culturally diverse backgrounds being the most important factor in team effectiveness, interpersonal adaptivity or the ability to be considerate of others' point of view and adjust appears to lead to more effectiveness. Consequently, when choosing team compositions and configurations, the interpersonal adaptivity of the members should be prioritized over perceived difference in cultural values. Furthermore, when choosing how to communicate

Further, most teams reported an element of face-to-face communication, which provides evidence for Kirkman, Rosen, Tesluk, and Gibson's (2004) assertion that virtuality is not a binary wherein teams are virtual or not, but rather a continuum where some teams are more virtual than others. In addition, this paper makes a key contribution to the research on virtuality and subgroups through its finding that member virtuality or the number of members dispersed over various sites related to perceived subgroup formations.

*Suggestions for further research*

There are several methodological changes which may be explored with subsequent research studies. In addition, for expanding the sample for a more representative and diverse pool, changing the methodological design may yield more precise measurements. Due to the documented effects of team tenure on several of our target constructs, we believe that subsequent studies may benefit from a longitudinal approach in order to track changes in perceptions of subgroup

formation and the its relationship with input variables over time. Additionally, this study would benefit from a multi-level approach in order to understand the relationships between individual adaptivity and cultural diversity, perceived subgroup formation, and virtuality at multiple levels of analysis. Subgroup divisions and communication processes may vary across multiple levels including business unit and across the organization. According to Meyer and Glenz (2013), subgroup formation can occur at nested levels, with team members often being a part of multiple subgroups.

In addition, because none of our interaction effects were significant, it may be fruitful to work the same constructs in a reconfigured model. Our paper examined interpersonal adaptivity as the moderator in the relationship between team virtuality, cultural diversity and perceived subgroup formation and found significant relationship between interpersonal adaptivity and team effectiveness. Further research can investigate perceived subgroup formation as a moderator for the relationship between interpersonal adaptivity and team effectiveness to test whether subgroup formation would weaken this positive relationship between the two. Further, we also found a positive relationship between cultural diversity and interpersonal adaptivity. Further research can potentially further examine the link between the three.

Further research may also benefit from using more multidimensional methods of measurement. In addition, we used a unidimensional measure of virtuality, despite the evidence that virtuality is a multi-dimensional construct. In approach, which combines or reflects the multi-dimensional nature of the construct may be able to better specify the effects of virtuality on subgroup formation.

In addition, we focus on Hofstede's individuality dimension as our main measure of cultural diversity. However, accordingly, this only reflects a single dimension of cultural diversity. As Hofstede (1991)'s measures indicate, culture is a complex, layered construct with many dimensions of difference. Further research may be able to integrate multiple dimensions and better explain the effects of cultural diversity on teams.

## Conclusion

This study attempted to understand how new team structures, such as more diverse and virtual teams can be more effective. One of the built-in assumptions

of the model was that team level variables such as cultural diversity and virtuality would affect team effectiveness and that subgroup formation is a potential association which affects team effectiveness. Our main finding suggests that team virtuality have a positive relationship to perceived subgroup formation, however, we did not find support for other assumptions, but rather than interpersonal adaptivity had the greatest association with team effectiveness.

Two of the key findings from the research model were that interpersonal adaptivity had a statistically significant relationship with team effectiveness and team tenure, as a moderator, showed a negative relationship with perceived subgroup formation, while none of expected independent variables or modeled interaction effects showed a statistically significant relationship with team effectiveness. Although we tried numerous measures, none of the measures for cultural diversity or virtuality showed a relationship with team effectiveness, despite the literature which suggests that both are drivers for perceived subgroup formation and that perceived subgroup formation has a negative relationship with team effectiveness. How teams adapt and the individual competencies to adapt to changes is a dynamic process and difficult to model solely based on linear models; however, our findings provide evidence that understanding team adaptation based on competencies and team characteristics can enhance our understanding of what drives team effectiveness.

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# Appendices

### Appendix 1. Perceived formation of fault-lines measure items (Jehn et al., 2006)

1. Communications (e.g., emails, phone calls) happened only among part of the group

2. I found it easier to communicate (e.g., sending emails, talking on the phone) with certain group members than others

3. I preferred to ask project related information from certain group members over others

4. One or more group members did not act like part of our group

5. I withheld some project-related information from certain group members

6. If one or more group members were omitted from our group, it would have been much easier to finish this project

### Appendix 2. Team Adaptive Performance measure items (Pulakos et al., 2000)

*Demonstrating interpersonal adaptivity:*

1. I am flexible and open-minded when dealing with my team members

2. I develop effective relationships with diverse personalities in my team

3. I listen to and consider other teammates' viewpoints and opinions, and alter my opinions when appropriate

4. I tailor my own behavior to work more effectively with colleagues and team members

5. I adjust my interpersonal style to achieve collective goals

*Demonstrating cultural adaptivity:*

1. I learn about the orientation, needs, and values of my team members from other cultures

2. I am comfortable working with team members who have different values, customs, and cultures from my own

3. I adjust my behavior to show respect for my team member's values and customs

4. I adjust my approach to maintain positive relationships with team members from other cultures.

5. I form good relationships with people from other cultures

### *Appendix 3. Team Performance measure items (Hackman, 1987)*

1.Work by this team meets or exceeds the requirements for quantity and quality as specified by the objectives of the project

2. I am satisfied with the overall quality of my relationship with other team members

3. The processes that the team uses to carry out its objectives are efficient, effective and cooperative

4. I am satisfied with the way out team makes decisions

### *Appendix 4. Principle Component Analysis result*

| Pattern Matrix | | | |
|---|---|---|---|
| | Component | | |
| | 1 | 2 | 3 |
| Work by this team meets or exceeds the requirements for quantity and quality as specified by the objectives of the project | | | 0.712 |
| I am satisfied with the overall quality of my relationship with other team members | | | 0.609 |
| The processes that the team uses to carry out its objectives are efficient, effective, and cooperative | | | 0.893 |
| I am satisfied with the way our team makes decisions | | | 0.651 |
| One or more team members does not act like | 0.826 | | |

| | | | |
|---|---|---|---|
| part of our team | | | |
| Team communications happen with only among part of the team | 0.775 | | |
| I find it easier to communicate with certain team members than others | 0.747 | | |
| I prefer to ask for project related information from certain team members over others | 0.776 | | |
| I withhold some project-related information from certain team members | 0.800 | | |
| If one or more team members were omitted from our team, it would be much easier to finish this project | 0.847 | | |
| I am flexible and open-minded when dealing with my team members | | 0.692 | |
| I develop effective relationships with diverse personalities in my team | | 0.784 | |
| I listen to and consider other teammates' viewpoints and opinions, and alter my opinions when appropriate | | 0.633 | |
| I tailor my own behavior to work more effectively with colleagues and team members | | 0.795 | |
| I adjust my interpersonal style to achieve collective goals | | 0.753 | |

*Note:*

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

Rotation converged in 5 iterations.