

# Disaggregating the Impacts of Virtuality on Team Identification

**Lionel P. Robert Jr.**  
School of Information  
University of Michigan  
Ann Arbor, MI 48109 USA  
lprobert@umich.edu

**Sangseok You**  
School of Information Studies  
Syracuse University  
Syracuse, NY 13088 USA  
syoun03@syr.edu

## ABSTRACT

Team identification is an important predictor of team success. As teams become more virtual, team identification is expected to become more important. Yet, the dimensions of virtuality such as geographic dispersion, reliance on electronic communications and diversity in team membership can undermine team identification. To better understand the impact of virtuality, the authors conducted a study with 248 employees in 55 teams to examine the complex and codependent effects of virtuality. Results indicate that although geographic dispersion and perceived differences can undermine team identification, reliance on electronic communications increases team identification and weakens the negative relationship between perceived differences and team identification.

## Author Keywords

Team identification; virtual team; virtuality

## ACM Classification Keywords

H.3.5; H.4.3; K.6.0

## General Terms

Theory

## INTRODUCTION

Virtual teams allow organizations to assemble diverse sources of knowledge across organizational and geographic boundaries [26,67,72,91]. Many of these teams have diverse members who are geographically dispersed and rely primarily on some forms of electronic communication [57,58,65,77]. The use of these teams has increased with the availability of electronic communication technologies [3,60,72]. This has led to the emergence of what are often labeled virtual teams [27,42]. Despite the advantages, these teams also face tremendous difficulties and challenges

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[41,54,78]. One such challenge is their ability to maintain a strong team identity [8,21,87].

Team identification can be described as the oneness that individuals feel toward their team [50]. It represents an emotional attachment to the team [63,64]. Team identification is associated with higher levels of teamwork, lower levels of conflict and better team performance. In turn, when team members have low levels of team identification they are *less* willing to put forth effort on behalf of the team and often focus on their own personal interests. Therefore, it is not surprising that team identification is seen as an essential element to promoting successful teams [8,65].

Although team identification is an important predictor of team success, it has also been found to be more difficult to develop in virtual environments [21,65]. Prior literature indicates that the frequency of day-to-day contact and feelings of similarity between members promote identification in teams. Yet, teams today are often composed of members with different backgrounds and skills and who rarely, if ever, meet face-to-face [17,25,67]. Therefore, it is not surprising that geographic dispersion, reliance on electronic communication, and the effects of diversity are often used to explain why team identification is harder to develop and yet more important in virtual teams [8,25,35,65,69,87].

However, prior literature has used one measure to represent geographic dispersion, reliance on electronic communication, and the effects of diversity, or some combination of these factors [25,34,35]. In doing so, these studies assumed that all these factors have a similar negative impact on team identification. This is problematic for several reasons. First, electronic communications can actually promote identification and facilitate team coordination [90]. Second, the effects of team diversity are not always salient and in many cases team diversity has no effect on teamwork [30]. Many scholars suggest that perceptions of differences are needed to know when diversity has triggered the in-group out-group processes associated with the negative effects of diversity [31]. In all, electronic communications and team diversity may not make it harder to identify. This suggests that one construct to represent all three factors may be at best inaccurate or at worst misleading. Given both the theoretical and empirical

importance of this topic, it becomes imperative to better understand the challenges associated with team identification in virtual teams.

To address these issues, in this paper we took a different approach from previous studies. First, we separately examined the impacts of geographic dispersion, reliance on electronic communication (i.e. email, chat, voice, and video), and diversity on team identification. We chose these three factors because they have typically and consistently been used to explain why virtual teams have trouble achieving high levels of team identification [21,25,32,34,35]. Second, unlike prior researchers who have examined actual diversity (e.g., nationality; [23,25]), we examined perceived differences among team members. Research has found that perceptions of differences are what drive the negative impacts of actual diversity [30,31]. Third, we proposed and examined the interplay between each of the impacts of virtuality on team identification. It could be quite possible that the impact of each factor related to virtuality varies depending on the others. If this were true, then the impact of the use of electronic communications would be dependent on team dispersion and vice versa.

In this paper, we present and empirically test a research model that explains how each dimension of virtuality influences team identification, separately and then jointly. We conducted a study involving 248 individuals in 55 teams with varying degrees of virtuality. Results generally support the research model. Overall, this paper contributes to the GROUP literature by highlighting the complex role of virtuality on team identification.

This paper contributes to the literature in the following ways. First, this study contributes by highlighting the complex ways in which virtuality can influence team identification. In doing so, this study goes beyond existing literature on virtuality and team identification. Second, this research contributes to our understanding of the relationship between electronic communications and team identification by demonstrating electronic communications' positive impacts on team identification. Previous literature has normally lumped together the effects of electronic communication with either dispersion, diversity or both. This has incorrectly led many studies to conclude that electronic communications inherently reduce team identification. Third, this research enhances our understanding of the effects of diversity on team identification. Research has consistently shown that perceived differences are one way that team diversity can negatively impact team performance [31,57,58]. This study demonstrates how geographic dispersion and the use of electronic communications can weaken the negative effects of perceived differences on team identification. Finally, the results of this study have several implications for designers.

## RELATED WORK

### Team Identification

Team identification can be described as a sense of belonging or oneness that individual team members feel toward their team [5,69]. Social identity and self-categorization theories are often used to explain team identification [37,80]. An individual's social identity defines who he or she is in comparison to others. Self-categorization is a process by which individuals place themselves and others into in-groups and out-groups. Individuals place those who seem to be like themselves into in-groups and those who do not seem to be like themselves into out-groups. When a team member places himself/herself and other team members into the same in-group, identification with the team is said to have occurred [19,86].

Team identification has important benefits for all teams. In general, the more individuals identify with a team the more they adopt norms and behaviors of that team [36,81,83,86]. When individuals strongly identify with their team they feel a "common fate" with their team members and adopt the team goals as their goals [45]. Team members will put more emphasis on the team's interest rather than their own. Both the perception of common fate and putting the team's interest ahead of one's own can have benefits for the team. As such, it is not surprising that team identification is positively associated with several important outcome variables. For example, prior research has found that team identification is associated with higher levels of altruism, collective behaviors, cohesion and ultimately team performance while at the same time it is associated with lower levels of conflict, social loafing, and tardiness [20,28,38,46,52,56,67,69,72,73,85]. The benefits of team identification are particularly important for activities that are interdependent [11,69].

Team identification may be more important in virtual teams. Dimensions of virtuality such as geographic dispersion, electronic dependence and team diversity may hamper team identification [21]. Yet, these very same dimensions of virtuality may make identification more important in virtual teams [89]. Team identification can work as the glue that bridges members in different locations by creating affective ties among team members [51]. Moreover, the disadvantages from dispersion, such as a low visibility and trust, can be overcome by inducing cohesion and a sense of shared faith [34,77]. Team identification promotes these things and ultimately leads to better team performance [8,87].

Prior research supports the benefits associated with team identification in virtual teams. The "psychological bonding" created through team identification among distant team members has been found to increase interpersonal trust and retention of valuable employees [90]. Fiol and O'Connor insisted that team identification needed to be emphasized in virtual teams and face-to-face teams to minimize the

negative outcomes associated with team diversity [21,58]. Gibson and Gibbs demonstrated that the lack of team identity may hinder virtual teams from team innovation and increase uncertainty in team process [25]. Marks and Lockyer found that team identification is positively related to satisfaction in software teams [52]. Staples and Zhao suggested that the problems associated with cultural diversity in virtual teams such as interpersonal disagreements, low cohesion, and satisfaction were caused by the inability of team members to identify with their virtual team [78].

**Impacts of Virtuality**

There are many ways to conceptualize virtuality (see [25] for a review). However, traditionally researchers have conceptualized virtuality as either present or not (i.e. virtual or face-to-face). This binary view of virtuality is still valid but it has at least one disadvantage. Binary approaches lump together things like geographic dispersion, reliance on electronic communications, and issues related to diversity (e.g., perceived differences) into one bucket. This assumes that all three elements of virtuality have similar effects, when in fact they may not. Martins and colleagues wrote one of the first papers to suggest that all teams can be defined as more or less virtual [54]. They argued that virtuality should be viewed as a continuum rather than the traditional binary view (i.e. simply present or not).

There is another view of virtuality that conceptualizes it as separate and distinct dimensions. This view separates the effects of dispersion from those associated with electronic communications [34]. For example, Gibson and Gibbs conceptualized and operationalized virtuality as separate and distinct dimensions that included geographic dispersion, reliance on electronic communications, and team diversity [25]. They identified these dimensions by reviewing the “Web of Science” and extracting dimensions based on the highest frequency of appearance in virtual team studies. Results of their study confirmed that each dimension had independent effects on team innovation. O’Leary and Cummings and Cummings et al. also put forth the idea that the effects of virtuality could be taken apart and examined independently [15,59]. In doing so, many scholars argue that dispersion can be associated with reductions in face-to-face communications but does not completely eliminate them and that reliance on electronic communications is one dimension of virtuality [42,54].

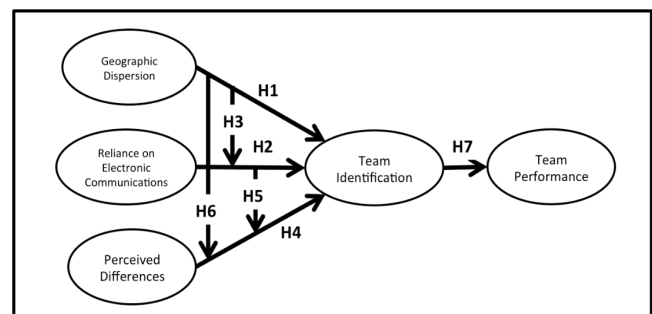
Researchers who have conceptualized virtuality as separate dimensions each along a continuum have found that the impacts of virtuality vary greatly [4,48,71]. For example, it is widely known that geographic dispersion can deteriorate team performance by increasing coordination effort and decreasing communications [4]. But other studies have found that dispersion also facilitates more open discussions [47,48]. There are ongoing debates with regard to whether electronic communications are beneficial or problematic for teams [6,21,89]. Likewise, the impacts of diversity have

normally been assumed to be harmful to virtual teams [21,41,78]. Yet, Ye and Robert [92] discovered that diversity actually increased creativity in virtual teams high in collectivism. Taken together, it is required to examine interplay among the different aspects of virtuality to better predict their influence on virtual team performance.

This paper builds on previous literature that has conceptualized virtuality as separate dimensions each along a continuum. In this paper, we refer to these dimensions or elements as “the impacts of virtuality.” The impacts of virtuality are related but distinct ways in which the effects of virtuality materialize. Virtuality has many impacts but in this paper we are only interested in examining a subset of them in the literature. This subset comprises the three most commonly studied impacts of virtuality: geographic dispersion, reliance on electronic communications, and team diversity.

The effects of geographic dispersion, reliance on electronic communications and team diversity were selected in this study to represent virtuality. Most scholars agree that geographic dispersion and reliance on electronic communications are two important factors of virtuality [4,25,39,66,69,77]. In fact, it would be difficult to find a study of virtuality that did not include these two. In addition, the literature provides strong evidence with regard the effects of diversity on virtual teams [12,25,57,58,70]. Therefore, we included the impacts of diversity in the form of perceived differences. Perceived differences are beliefs about how different team members believe they are from one another [74,92]. Such perceptions can be invoked by surface-level diversity aspects (e.g., gender and nationality) or deep-level aspects (e.g., personality and values) [31,57,58]. Because the perceptions of differences can be generated by many types of actual differences [57,58,91], in this paper we chose to examine the effects of perceptions of differences among virtual team members as a proxy for many types of team diversity. This is because perceived differences can better capture the impacts of diversity than actual differences across different compositions of virtual teams [74,91].

Taken together, geographic dispersion, reliance on electronic communications, and perceived differences capture many of the aspects associated with virtuality. Figure 1 provides a summary of the arguments.



**Figure 1 Research Model**

## RESEARCH MODEL

### Geographic Dispersion and Team Identification

Although there are many views on the effects of virtuality on team identification, most scholars agree that geographic dispersion itself can be detrimental to team identification [14,21,25,33]. We believe geographic dispersion is negatively related to team identification for several reasons.

First, the identification process normally occurs through a series of interactions among team members [21,37,82]. In general, the more interactions among team members the more likely team members are to identify with the team [82]. Research has consistently shown that distance matters [60]. Geographic dispersion reduces the amount of communication and interactions between individuals [60]. In general, people communicate less with distant others than they do with individuals who are geographically closer [57]. This lack of communication and interactions can undermine the social psychological processes underlying identification [33,60,82].

Second, geographic dispersion is often associated with coordination problems. Cummings et al. [15] showed that geographic dispersion can cause delays in teamwork processes and make coordination more difficult. They argued that geographic dispersion makes it harder for teams to divide and sequence tasks [15]. This is in part because geographic dispersion makes it difficult for team members to know when members are available [14]. Coordination problems often lead to conflict, which has been shown to be negatively related to team identification [21,33,35].

Third, geographic dispersion often leads to more negative evaluations of dispersed team members. Attribution theory posits that individuals can attribute problems to their team or situational factors [2,14]. In the former case, individuals make harsh evaluations about their teammates when problems occur. In the latter, individuals are often more supportive and understanding when things go wrong. In dispersed teams, members often lack the contextual information needed to assess a given situation. This explains why research has shown that individuals in dispersed teams tend to attribute blame to their teammates rather than to the situation when things go wrong [3,14]. This evokes negative attitudes and emotions toward their team, which should be negatively related to identification with the team.

Taken together, the lack of communication, coordination problems, and attribution theory all seem to indicate that geographic dispersion reduces team identification.

*H1) Geographic dispersion is negatively related to team identification.*

### Reliance on Electronic Communications and Team Identification

Many scholars disagree about the impact of electronic communications on teamwork. As we mentioned, communication and interactions are strong predictors of

identification. Some scholars believe that electronic communications are not as effective in transmitting meaning or supporting relationships across distances [16,75]. However, these studies tended to focus on what is often referred to as lean versus rich media [68]. When such classifications fell out of favor, scholars began to rethink the impact of electronic communications on identification and other social-emotional constructs [21,88,90].

Despite this, many studies have found a negative relationship between electronic communications and process and outcome variables similar to team identification (see [6]). However, we believe this is due to the fact that many studies often lump together both geographic dispersion and the reliance on electronic communications. In fact, many scholars believe electronic communications can have positive impacts on team relationships [21,88,90].

Electronic communications offer affordances that support team identification. To start, electronic communications can support more equal participation among team members during team communications [69]. In face-to-face settings, normally one person is able to speak at any given moment and everyone else has to listen. Unfortunately, this often allows a subgroup of individuals to dominate team discussions. As a result, other members are not given equal opportunity to share their perspective [18,69]. Several studies have confirmed this problem in face-to-face team discussions (see [62] for a review). The inability to equally participate in team discussions is likely to be associated with reductions in team identification. However, several types of electronic communications like email and chat can support the ability of multiple individuals to communicate simultaneously [68]. This allows more than one individual to effectively speak at the same time. This allows everyone the opportunity to participate in team discussions. Prior research has confirmed that the use of electronic communications has been associated with more equality during team discussions [62,69]. Higher levels of equality in team discussions should be positively related to team identification.

Electronic communications have additional benefits that should increase team identification. The use of electronic communication technologies can facilitate more communication among team members. Regardless of the geographic location of team members, individuals often find it difficult to schedule meetings when everyone is available. Electronic communications do not require everyone to be in one place at a given time. This means that electronic communication can increase the opportunities teams have to communicate. The frequency of communication is a strong predictor of identification [86,90]. Electronic communications can increase the effectiveness of team communications. Because most electronic communications technologies afford recording and restoring features, members in virtual teams can review communication history and revise messages for future

interaction, which raises comprehensibility of communications and readability of messages, respectively [13]. Both the ability to communicate more often and increases in communication effectiveness can be particularly critical to building team identification [55].

Prior literature has confirmed the potential positive relationship between electronic communications and team identification. For instance, Suh et al. found that the use of electronic communications supported consensus and relationship-building, which both facilitated team identification [79]. Marlow and Dabbish showed that electronic communications could be used to facilitate the formation of a shared identity by promoting pro-social behaviors among individuals [53]. Bouas and Arrow found that although teams using mediated communications experienced lower team identity than face-to-face teams, over time they were able to establish team identity as high as teams that primarily relied on face-to-face communications [9]. In fact, some scholars argue team identifications can be constructed more easily in virtual teams. A study based on social identity model of deindividuation effects (SIDE) found that some electronic communications can facilitate the identification process [76].

*H2) Reliance on electronic communications is positively related to team identification.*

#### **Geographic Dispersion and Reliance on Electronic Communications and Team Identification**

The positive relationship between reliance on electronic communications and team identification should become stronger as teams become more geographically dispersed. We posit that the more dispersed a team is, the more likely electronic communications are to become members' primary means of communication. The less dispersed the team members, the less likely they are to rely on electronic communications.

Initially, electronic communication can be problematic, but experience regarding the electronic communication technology, team, and task can create a situation where electronic communications can better support the social-emotional processes needed to facilitate team identification when teams have no other means of communication [88] (see [89] for a review). This is most likely to occur in teams that have to rely on electronic communications rather than face-to-face communications as their primary means of communication. Many studies have supported the enriching aspects of electronic communication in dispersed teams that rely on it as their primary means of communications [18,27,68,69].

Therefore, we propose that the impact of electronic communications on team identification is relative to the team's dispersion. The more dispersed teams are, the stronger the use of electronic communications will have on team identification. In teams that are highly dispersed,

electronic communications are more likely to be their primary means of communication. Communications should be positively related to team identification. For example, electronic communications have been found to be a strong predictor of organizational identification when employees are dispersed [90].

*H3) The relationship between reliance on electronic communications and team identification is stronger as geographic dispersion increases.*

#### **Perceived Differences and Team Identification**

Perceived differences represent the perceptions of interpersonal differences among team members in values, attitudes and beliefs [31]. Differences among team members have been found to have negative implications for both face-to-face and virtual teams. For example, Kankanhalli et al. found that cultural diversity and functional background diversity increased conflict in global virtual project teams [41]. Similarly, Staples and Zhao found that cultural diversity resulted in lower satisfaction and cohesion in virtual teams [78]. Gibson and Gibbs discovered that national diversity reduced team innovation [25].

The negative effects associated with perceived differences are directly related to the identification process. As we mentioned earlier, individuals place others and themselves into in-groups and out-groups. Team identification occurs in part because individuals place themselves and their teammates into the same in-group. This means that individuals believe that they are similar to their teammates rather than different [84]. However, when team members believe they are different from their teammates the identification process is undermined.

The problems associated with perceived differences explain why many scholars thought identification would be difficult for virtual teams [51]. In general, virtual teams are composed of people from different locations with different knowledge, skills and beliefs that are also more likely to be demographically diverse [23,34,35]. Many scholars have argued that these negative implications of team diversity are often in part transmitted through perceptions of differences [31]. Therefore, perceived differences should be negatively related to team identification [24,25,29,61,65].

*H4) Perceived differences are negatively related to team identification.*

#### **Perceived Differences, Geographic Dispersion, and Reliance on Electronic Communications and Team Identification**

Although distance among team members is often seen as a negative, it could be a good thing. Individuals prefer to interact less often with those they believe are different and more often with those they believe are similar [31,57,58]. This idea is derived from the similarity-attraction paradigm [10]. This paradigm posits that perceptions of similarity between teammates in values, beliefs, and attitudes

engender greater interpersonal trust and collaboration while perceptions of dissimilarity between teammates in values, beliefs, and attitudes reduce trust and collaboration (e.g., [31,49]). In general, individuals do not prefer to interact with those they believe are different from them. This explains why perceptions of differences are negatively reduced to team identification.

The negative relationship between perceived differences and team identification should be weakened by the reliance on electronic communications and geographic dispersion. Electronic communications can be less personal than face-to-face interactions [69]. Electronic communications can also allow team members to communicate or not communicate with their teammates if and when they choose. The use of electronic communications allows individuals to minimize their personal interactions with their teammates. Therefore, as teams rely on electronic communications, team members do not have to personally meet with dissimilar others. The reduction of face-to-face contact should weaken the negative relationship between perceived differences and team identification.

Geographic dispersion also reduces contact among team members [60]. This should benefit teams with members who perceive that they are different from their teammates. When teammates are physically dispersed they are less likely to meet face-to-face with their teammates. Geographic dispersion provides distance among teammates. Although this reduces the frequency of contact among team members, which reduces team identification, it can have a calming effect when team members believe they are different.

*H5) The negative relationship between perceived differences and team identification decreases as reliance on electronic communications increases.*

*H6) The negative relationship between perceived differences and team identification decreases as geographic dispersion increases.*

#### **Team Identification and Virtual Team Performance**

Team identification should lead team members to engage in positive behaviors to achieve collective objectives. According to social identity theory, as mentioned, individuals tend to enhance their identity as a member of a team by reinforcing the value of being on the team. In general, when team members identify with the team, they tend to comply with team goals and are more motivated to work on behalf of the team. When team members identify with the team, potential conflicts can be reduced and satisfaction can be increased [65]. Team identification positively influences coordination effectiveness and productivity [43]. Additionally, team members can be more motivated to participate in the team tasks that increase team performance [93].

Several studies have found that team identification increases the performance of teams regardless of their level

of virtuality. For example, Robert et al. found that identification was important to the performance of both collocated teams who performed tasks in a face-to-face setting and dispersed teams who performed tasks using a type of electronic communication [69]. Robert also found in a multi-level study that team identification increased team performance in virtual teams [65]. As such, theories and empirical findings imply that team identification should be positively related to performance in virtual teams.

*H7) Team identification is positively related to team performance.*

#### **METHOD**

##### **Participants**

The participants were employees of an information technology (IT) solution vendor that focuses on providing human resources software and IT support for clients. Team tasks consisted mainly of problem-solving related to one of two sets of responsibilities: installation and implementation, or maintenance. Installation and implementation involved either bringing a new system online, installing a new module of an existing system or upgrading the existing system. Maintenance normally involved handling client issues related to the problems associated with the existing software. For example, if the clients were having trouble with their system the team would address the technical issues.

Although some team members worked at a client's site temporarily, most worked remotely from home to address client issues online. Members of these teams were dispersed and relied on electronic communications. The tasks and the working conditions required team members to engage in frequent online interaction and coordination to accomplish their work. Team members were polled about the level of task interdependence their work required. On a scale of 1 to 7, with 7 being the highest, the team's average score was 5.5. This indicates that team members felt that their work was closely coupled.

No formal leaders were assigned to the teams, but each team was assigned a client group advocate. These advocates were not a member of the team and were primarily responsible for maintaining the relationship with the client and evaluating the team's work. The organization participated in a study to determine the effectiveness of remote work. As part of their participation agreement, one of the researchers agreed to provide a white paper to members of the executive team.

A total of 470 employees in 70 teams were targeted for participation. We employed two team surveys and received responses from more than 50% of the members of 60 teams across both surveys. However, five teams were dropped because we could not obtain performance ratings for them. As a result, we were left with 248 individuals in 55 teams with an average response rate of 70% per team. Participant

ages ranged from 26 to 52 with a mean age of 37 years. The size of the teams ranged from 6 to 8 with a mean of 6.7.

**Data Collection**

We collected data via two online surveys. The first survey, sent via email, was up for 1 month and had questions regarding control variables — perceived differences, dispersion, and use of electronic communications. The second survey was sent 3 months later and had questions regarding team identification. We obtained performance ratings using a third survey that went only to client group advocates. In all three cases, we sent follow-up email reminders to encourage participation. In addition, client group advocates were instructed by upper management to encourage all employees to participate.

The surveys were web-based and all individual responses were confidential and only seen by the research team. The surveys used well-established multi-item scales, which we summarize in the measurements section. We used a seven-point Likert scale to measure team identification and perceived differences. The second survey was typically administered about 1 week before the project was due.

**Measurements**

*Control Variables*

We used several control variables to reduce the possibility of alternative explanations. Because research has found that team tenure, organizational tenure, size, and age can impact team outcomes, we included these as control variables [25,42]. Team tenure was the number of years the team was together and team individual average tenure was the number of years the average team member had been employed.

*Independent Variables*

Reliance on electronic communications was determined by asking individuals how much they collaborated via face-to-face meetings, email, chat, phone, and video (see Table 1 for a breakdown of scores across all communication types). All team members had access to each of the technologies via software provided by the company. However, employees were not limited to that particular software and the questions were not intended to assess their use of that software system.

Team Electronic Communications	Percentage
Face-to-face meeting	10
Email	41
Chat	18
Phone/voice only communications	19
Video communications	12

**Table 1 Breakdown of scores of all communication types**

To calculate the score for reliance on electronic communications, we averaged the scores across all three items seen below. (1) How frequently did your team engage in collaborative interactions through electronic communications (i.e. email, chat, voice only, and video)? (2) How openly did your team engage in collaborative

interactions through electronic communications (i.e. email, chat, voice only, and video)? (3) How extensively did your team engage in collaborative interactions through electronic communications (i.e. email, chat, voice only, and video)? The aggregation of electronic communications was consistent with previous literature on virtuality [25,34,42,56].

To create a multi-item measure of geographic dispersion we used an item from [79] and [15]. The first item asked team members “To what extent did your teamwork take place at different locations?” Answers ranged from (1) never, (2) almost never, (3) very rarely, (4) occasionally, (5) often (6) almost always (7) always. The second item from [15] asked team members to indicate the extent to which they were physically separated from other members of their team. The scale consisted of the following ranges: (1) same room, (2) different room on the same hallway, (3) different hallways, (4) different floor, (5) different building, (6) different city and (7) different country. At the team level, we computed the average dispersion among members to determine the extent to which the team was dispersed.

To measure the perceived differences, we adapted items from Harrison et al. [31]. Team members rated on a seven-point scale (1-strongly disagree to 7-strongly agree) how different they thought their team members’ work styles were. The items included: (1) Members of my team have different work ethics, (2) Members of my team have different work habits, (3) Members of my team have different communication styles, (4) Members of my team have different interaction styles, and (5) Members of my team have different personalities.

*Dependent Variables*

There were two dependent variables, team identification and team performance. Identification with the team was based on a four-item scale taken from [40]. Items included: (1) I talk up this team to my friends as a great team to work in, (2) I am very committed to my team, (3) I am proud to tell others that I am part of this team, and (4) I feel a sense of ownership for this team.

We obtained team performance data from client group advocates. They were asked to rate three statements with regard to a particular team: (1) This team was efficient in providing services and support to its clients, (2) This team was effective in providing services and support to its clients, and (3) This team met or exceeded my expectations in fulfilling its overall objectives.

**RESULTS**

We obtained all latent construct measures at the individual level of analysis. To justify aggregating the data to the team level, we used an intra-class correlation coefficient (ICC) to measure the between-team variance. The ICC indicates how much variance in the individual response is from team

Variable	M	SD	Reliability	1	2	3	4	5	6	7	8	9	10
1 Geographic Dispersion	5.00	0.75	0.83										
2 National Diversity	0.60	0.20	N/A	-0.11									
3 Perceived Diversity	2.50	0.72	0.88	0.07	-0.30*								
4 Reliance on Electronic Communications	4.20	0.90	0.85	-0.54***	-0.10	-0.20							
5 Team Average Age	37.00	4.90	N/A	-0.07	-0.16	0.02	0.02						
6 Team Identification	4.80	0.91	0.92	0.06	-0.06	-0.27*	0.29*	0.14					
7 Team Individual Average Tenure	6.30	3.00	0.92	-0.10	0.06	-0.29*	0.19	0.35**	0.40**				
8 Team Performance	5.70	0.56	N/A	-0.02	-0.32*	0.03	0.07	0.34*	0.38**	0.065			
9 Team Size	6.50	1.40	N/A	0.24	0.22	0.07	-0.28*	-0.06	-0.15	-0.05	-0.25		
10 Team Tenure	6.30	3.00	N/A	-0.11	-0.10	0.05	0.06	0.36**	0.13	0.03	0.21	0.04	

Notes:  
1. M = Mean; SD = Standard Deviation  
2. Significance of correlations: \*p<.05; \*\*p<.01; \*\*\* p<.001  
3. N = 55

**Table 3 Means, Standard Deviations, Reliabilities, and Correlations of Continuous Variables**

Item	1	2	3	4	5
Geo. Dispersion 1	<b>.85</b>	.29	.21	.26	.21
Geo. Dispersion 2	<b>.89</b>	.28	.09	.19	.09
Electronic Comm. 1	.24	<b>.85</b>	.17	.13	.17
Electronic Comm. 2	.20	<b>.88</b>	.01	.10	.11
Electronic Comm. 3	.30	<b>.83</b>	.01	.11	.08
Team identification 1	.20	.11	<b>.91</b>	.22	.21
Team Identification 2	.25	.12	<b>.78</b>	.14	.09
Team Identification 3	.21	.15	<b>.95</b>	.13	.18
Team identification 4	.24	.20	<b>.85</b>	.01	.01
Team Performance 1	.15	.11	.20	<b>.96</b>	.17
Team Performance 2	.23	.12	.19	<b>.97</b>	.09
Team Performance 3	.14	.22	.20	<b>.93</b>	.15
Perceived Differences 1	.23	.19	.25	<b>.88</b>	<b>.88</b>
Perceived Differences 2	.20	.11	.17	.05	<b>.91</b>
Perceived Differences 3	.23	.12	.09	.04	<b>.89</b>
Perceived Differences 4	.21	.20	.07	.16	<b>.94</b>
Perceived Differences 5	.30	.29	.18	.21	<b>.80</b>

**Note:** Principal Component Analysis was used for extraction method.

**Table 2 Factor Loading**

membership. Higher values indicate that team membership accounts for more individual variance. ICC values at or above .08 provide justification for aggregating the data [7,44]. Team identification had an ICC of .45, perceived differences had a .40, use of electronic communications had a .40 and geographic dispersion had an ICC score of .42. All ICC values were above the .08 threshold, providing justification for aggregating the data [7,44].

We assessed convergent and discriminant validity through factor loading (Table 2). All items loaded at the .70 or above level on each of their constructs while no cross-loadings were above .35. These are all indications of convergent and discriminant validity [22]. All reliabilities

were above .70. Means, standard deviations and reliabilities are all listed in Table 3.

Hypotheses were tested using partial least squares structural equation modeling (PLS). PLS is robust structural equation modeling (SEM) technique with small sample sizes [69]. Significance tests were conducted using 1,000 bootstrap resampling. To reduce the possibility of multicollinearity, as recommended by Aiken and West [1], we standardized all continuous variables in the model (Table 4).

Independent Variables	Team Identification			R <sup>2</sup>
	1	2	3	
<b>Step 1: Control Variables</b>				
National Diversity	-.07	-.03	-.10	
Team Average Age	.15	.13	.10	
Team Ind. Aver Tenure	.33*	.23	.18	
Team Size	-.17	-.23	-.20	
Team Tenure	.18*	.13	.10	
				.18**
<b>Step 2: Main Effects</b>				
Geographic Dispersion		-.20*	-.03	
Reliance on Electronic Comm.		.32*	.10	
Perceived Differences		-.21*	-.67**	.36***
Change in R <sup>2</sup>				.18***
<b>Step 3: Interaction Effects</b>				
GD × EC			.44**	
PD × EC			.48***	
PD × GD			.62**	.66***
Change in R <sup>2</sup>				.48***
N=55 Standardized regression coefficients are reported (Beta weights). Continuous variables were standardized. GD = Geographic Dispersion; EC = Reliance on Electronic Communications; PD = Perceived Differences				
*p<.05; **p<.01; ***p<.001				

**Table 4 Results of Team Identification**



Model 1 shows the effects of control variables on the dependent variable. Model 2 shows the main effects of the independent variables. Model 3 shows the impact of the two-way interaction effects on team identification. The final model predicted a significant amount of the variance for team identification. We also found that there was a significant increase in the amount of variance explained by the inclusion of the interaction effects.

The results for the models examining team performance are shown in Table 5. Model 1 shows the effects of control variables while Model 2 shows the main effects of the independent variables. Results show that Model 2 explained a significant amount of the variance of team performance.

Variables	Team Performance		R <sup>2</sup>
	1	2	
<b>Step 1: Control Variables</b>			
National Diversity	.27**	.24*	
Team Average Age	.15	.23**	
Team Ind. Aver Tenure	.33**	.16*	
Team Size	-.17	-.16*	
Team Tenure	.18*	.11	.13
<b>Step 2: Main Effects</b>			
Team Identification		.32**	.38**
Change in R <sup>2</sup>			.25
N=55 Standardized regression coefficients are reported (Beta weights). Continuous variables were standardized.			
*p<.05; **p<.01; ***p<.001			

**Table 5 Results of team performance**

Among the control variables shown in Table 4, only average team individual tenure and team tenure were significant predictors of team identification. However, in Table 5, all the control variables were significant predictors of team performance in Models 1, 2 or 3.

Hypothesis 1, which posited that geographic dispersion would be negatively related to team identification, was supported. Model 2 included the main effects of independent variables (Table 4). From the regression analysis, geographic dispersion was negatively related to team identification ( $\beta = -0.20$ ,  $p < 0.05$ ). This result indicates that team identification was reduced as geographic dispersion increased. Hypothesis 1 was supported.

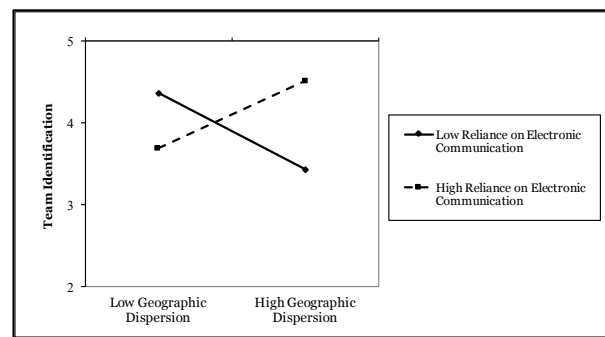
Hypothesis 2 posited that reliance on electronic communications would be positively related to team identification. Model 2 shows that reliance on electronic communications was positively related to team identification. The main effects of reliance on electronic communications were significant in both Model 2s ( $\beta = 0.30$ ,  $p < 0.05$ ). Therefore, hypothesis 2 was supported.

Hypothesis 3 posited that the effects of geographic dispersion and reliance on electronic communications

would interact. Model 3 shows that there was a significant two-way interaction effect on team identification ( $\beta = 0.44$ ,  $p < 0.01$ ).

Details of the interaction effect are shown in Figure 2. One standard deviation above and below the mean was used to represent high and low conditions for both the moderator and independent variable. Reliance on electronic communications increased team identification as dispersion increased. This supports hypothesis 3.

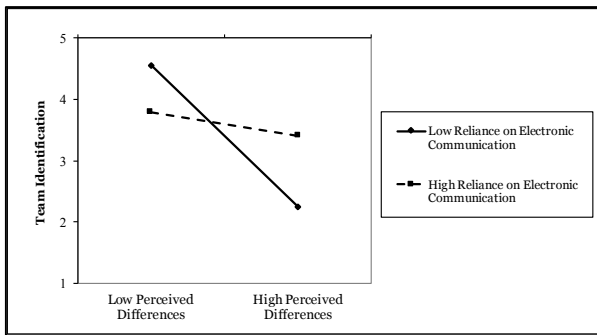
Hypothesis 4 stated that perceived differences are negatively related to team identification. Results shown in Table 4 indicate that there was a significant main effect of perceived differences on team identification in Model 2 ( $\beta = -0.21$ ,  $p < 0.05$ ). Therefore, hypothesis 4 is supported based on our data.



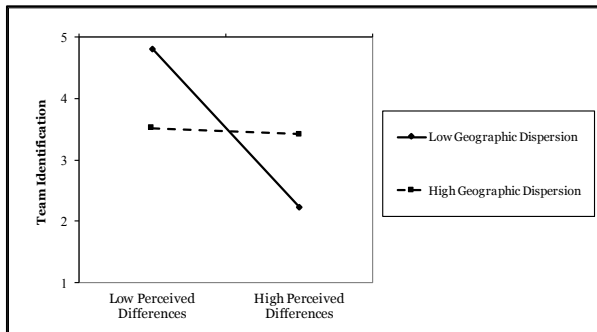
**Figure 2 The two-way interaction effect between geographic dispersion and reliance on electronic communications on team identification**

Hypotheses 5 and 6 stated the relationship between perceived differences and team identification would be moderated by the reliance on electronic communications (H5) and geographic dispersion (H6). The results demonstrate that there was a significant two-way interaction between perceived differences and reliance on electronic communications ( $\beta = 0.48$ ,  $p < 0.01$ ). Details of the interaction effect are shown in Figure 3. Similar to Figure 2, one standard deviation above and below the mean was used to represent high and low conditions. Thus, hypothesis 5 is supported. The interaction effect with geographic dispersion was also statistically significant ( $\beta = 0.62$ ,  $p < 0.01$ ). Thus, hypothesis 6 was also supported. Details of the interaction effect are shown in Figure 4.

Last, hypothesis 7 posited that team identification would be positively related to team performance. Table 5 indicates the results of linear regression analyses of the control variables and the independent variables with team performance as the dependent variable, respectively, in Model 1 and Model 2. We also included the control variables to demonstrate that team identification had an effect over and above those variables. As shown in Table 5, there was a significant main effect of team identification on



**Figure 3 The two-way interaction between perceived differences and reliance on electronic communications on team identification**



**Figure 4 The two-way interaction between perceived differences and geographic dispersion on team identification**

<b>H1)</b> Geographic dispersion is negatively related to team identification.	<b>Yes</b>
<b>H2)</b> Reliance on electronic communications is positively related to team identification.	<b>Yes</b>
<b>H3)</b> The relationship between reliance on electronic communications and team identification is stronger as geographic dispersion increases.	<b>Yes</b>
<b>H4)</b> Perceived differences are negatively related to team identification.	<b>Yes</b>
<b>H5)</b> The negative relationship between perceived differences and team identification decrease as reliance on electronic communications increases.	<b>Yes</b>
<b>H6)</b> The negative relationship between perceived differences and team identification decreases as geographic dispersion increases.	<b>Yes</b>
<b>H7)</b> Team identification is positively related to team performance.	<b>Yes</b>

**Table 6 Results of the hypothesis testing**

team performance in Model 2 ( $\beta = .32, p < 0.01$ ). The results show that team identification increases team performance. Hypothesis 7 was supported.

Overall, the research model was supported by the data. All hypotheses were supported. Table 6 summarizes the results of hypothesis testing.

## LIMITATIONS

Before discussing the implications of our findings, it is important to acknowledge the limitations of this study. First, all data were collected within one organization. Additional research is needed to determine whether our findings could be generalized to teams in other organizations. Another limitation of this study concerns internal validity. Many measures were gathered through self-reports. Although we employed two surveys to reduce common method variance, this should be considered a potential limitation. In addition, we aggregated all types of electronic communications into one construct. Although this was consistent with previous literature (see [25,34,42,56]), future studies could consider how specific types of electronic communication might alter the impacts. For example, video communications may not have the same suppressive impacts as electronic mail.

## DISCUSSION

Although team identification is a strong predictor of team performance, there are many questions about the impacts of virtuality on team identification. This paper presents a research model that examines three distinct but related impacts of virtuality: geographic dispersion, reliance on electronic communications, and perceptions of differences. Results of this study demonstrate that geographic dispersion and perceptions of differences are associated with reductions in team identification but reliance on electronic communications is associated with increases in team identification. However, the effects are more complicated: the positive relationship between reliance on electronic communications and team identification is much stronger when teams are collocated. When teams are dispersed, the positive relationship between reliance on electronic communications and team identification is greatly reduced. In addition, reliance on electronic communications can reduce the negative relationship between perceived differences and team identification. In fact, the negative relationship between perceived differences and team identification occurs when teams rely more on face-to-face interactions than on electronic communications.

### Implications for Research

This research contributes to the literature in several ways. First, it contributes to our understanding of the relationship between the reliance on electronic communications and team identification. Reliance on electronic communications has several positive impacts on team identification. It is directly associated with increases in team identification and more so when teams are collocated. Reliance on electronic communications also reduces the negative relationship between perceived differences and team identification. Prior conceptualizations of virtuality that lumped reliance on electronic communications along with geographic dispersion have found a negative relationship between virtuality and team identification. The negative impacts have been associated with both geographic dispersion and reliance on electronic communications [6,18]. However, by

separating the two, this study goes beyond prior literature by demonstrating the positive relationship between reliance on electronic communications and team identification rather than the negative relationship implied by prior literature.

Second, this research enhances our understanding of the effects of team diversity. Perceived differences can be invoked by many different types of team diversity. Research has consistently shown that perceived differences are one way that team diversity can negatively impact team performance [31,57,58]. This study demonstrates how the use of electronic communications can weaken the negative effects of perceived differences. This tells us that the effects of perceived differences depend largely on the amount of electronic communication and geographic dispersion among team members. Previous research has not identified any factors that have reduced the negative implications of perceived differences for teams. Taken together, these findings provide new insights into how to minimize the negative implications associated with perceived differences.

Finally, this study contributes to the literature on virtuality by highlighting the complex ways in which virtuality can influence team identification. This study goes beyond existing studies of virtuality that separate dimensions of virtuality by highlighting that the impacts of virtuality are often co-dependent. The strength of one dimension of virtuality can alter the associated effects of another dimension of virtuality. Therefore, it is not enough to just separate the effects of virtuality. This study tells us that one has to consider them in the relation to the other dimensions of virtuality.

#### **Implications for Designers**

The results of this study have several implications for designers. First, although the use of electronic communications was associated with higher levels of team identification, geographic dispersion was not. This may mean that the use of electronic communication technologies such as email, chat, phone, or video does not fully address the problems associated with geographic dispersion. The problems associated with geographic dispersion are due, in part, to a lack of contextual information [14]. Therefore, electronic communication systems have to be designed to better promote the sharing of contextual information. We believe that contextual information is exchanged best through informal rather than formal interactions. New systems should be designed to encourage informal interactions rather than simply formal task-related interactions. This could be done in part by having new systems prompt team members to share more information.

Second, new systems should take into account the location of team members at any given time. Although there are teams whose members are dispersed who never meet face-to-face and teams whose members are collocated and who primarily rely on face-to-face interactions, most teams probably exist between these two extremes at any given moment. For example, collocated teams may have members

who are, at any given time, temporarily dispersed. New systems should recognize the location of team members and adapt their capabilities to prompt the sharing of more contextual information when team members are dispersed and perhaps scale down such prompting when members are collocated.

Finally, electronic communication technologies should be designed to promote team identification. Although the effects of perceived differences were weakened by electronic communications, designers should envision a much more active role for such technologies. For example, Newell et al. designed a collaboration system that prompted users to complete an online profile about their individual characteristics and preferences [57,58]. The system selected the individual characteristics and preferences among team members that were similar within each team and suppressed or hid the information about individual characteristics and preferences that were dissimilar. They found that when team members received similar information about their teammates they had higher levels of social integration and performed better [57,58].

#### **Implications for Managers**

Our study also has managerial implications. Team identification has clear performance benefits for teams regardless of the geographic location of team members. However, geographic location seems to be a barrier to team identification and the use of electronic communications seems to benefit collocated teams more than dispersed teams. One approach to overcoming the problems associated with geographic dispersion is to encourage the sharing of contextual information through informal interactions. To facilitate the sharing of such information managers should encourage informal interactions among dispersed team members. This may mean setting up online gaming pools such as NCAA brackets or encouraging other informal activities. Another approach is for managers to convince team members of the importance of contextual information. Many team members may not believe this information is important or necessary. Through training, managers can inform team members of the necessity to share such information. Once team members are convinced of the importance of the contextual information, they should be more likely to share this information.

#### **CONCLUSION**

Team identification is an important predictor of team success and is seen as more important as teams become more virtual. However, the dimensions of virtuality can undermine team identification. The results of this study found that the impacts of virtuality are more complex than originally thought. More work is needed to fully understand the impacts of virtuality on team identification specifically and team relationships in general.

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