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Emergence of Differing Electronic Communication Norms Within Partially Distributed Teams

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Abstract. Modern organizations often consist of teams in which some people are collocated and some are remote. These teams are in-between being entirely virtual to entirely face-to-face and are referred to as partially distributed teams. Partially distributed teams function and operate in two different media environments, varying in availability of communication channels. These media environments may encourage different communication patterns, widening a gap produced by distance. In two laboratory studies we demonstrate that different electronic communication norms (ECNs) emerge among members of the same team based on their media environments. Most of the norms regarding use of electronic communication persisted even when media environment was changed. This difference in ECNs might serve as an additional faultline, causing an additional rift within distributed teams.

Keywords: partially distributed teams, virtual teams, communication norms, virtual work, faultlines, subgroups, electronic communication norm

Organizations increasingly depend on distributed teams (also referred to as virtual teams) to accomplish core work tasks (Bell & Kozlowski, 2002; Gibson & Gibbs, 2006; Hackman, 2011; Hinds & Kiesler, 2002). Although much research focuses on either distributed or collocated teams, most organizations are creating hybrid Partially Distributed Teams (PDTs). Cummings (2004) found that about 60% of Fortune 500 telecommunications companies are partially distributed. PDTs, where some members are collocated and others are remote (Burke, Aytes, Chidambaram, & Johnson, 1999), are subdivided by physical distance (some remote and some collocated), and may face challenges such as cultural barriers (e.g., Gibson & Gibbs, 2006) and lack of awareness of each other's activities. But they also live in different media environments where some are able to communicate through Computer-Mediated Communication (CMC) and Face-to-Face (FtF) while others can only communicate through CMC. We argue that distinct norms might emerge based on media environment differences. The development of two dissimilar norms within one team might accentuate and widen divisions between teammates who are already physically divided. PDTs have not received sufficient research attention (O'Leary & Mortensen, 2010). This paper sheds light on an important dynamic that can arise in

PDTs – the emergence of differing Electronic Communication Norms (ECNs).

To function well teams must communicate well, since communication affects team cohesiveness and effectiveness (e.g., Cramton, 2001; Snyder & Morris, 1984). Communication between teammates can be conducted in a variety of ways, including meeting FtF, writing email, using instant messaging, conducting video conferences, etc. Discrete communication channels differentially influence group outcomes depending on whether communication is cooperative, competitive, or neutral (Swaab, Galinsky, Medvec, & Diermeier, 2012). This paper specifically deals with the possible consequences for PDTs to develop different norms for the use of those communication channels.

Communication norms consist of the type of information shared, the rate of interaction, and/or formality of messages communicated (Kiesler, Siegel, & McGuire, 1984; Yates & Orlikowski, 2002). Norms can be implicit or explicit (Kelly, 1955), can either be taught directly, or can emerge while adapting to the habits of others. We specifically deal with ECNs, defined as distinct forms or styles of interaction shared by teammates when they communicate electronically. We argue that ECNs develop implicitly, based on the media environments in which individuals

reside. Our goal is to demonstrate that different ECNs emerge in a single team because they are using different electronic communication media. This in turn may have consequences on trust, cooperation, subgroup divisions, and, ultimately, on team performance.

Media Environments in Partially Distributed Teams

The media environment of members in PDTs can differ based on location. Remote locations may have other communication channels available to them including paper-mail, fax, phone, email, chat, video conference, etc. Collocated team members have access to other media, but also have FtF as an option, an option they will often choose, which leads to the exclusion of others. While remote members of PDTs work primarily in virtual environments, collocated members may switch between FtF and CMC environments. Thus, our main research question is whether differences in media environments in PDTs will result in the emergence of distinct and different ECNs.

Imagine receiving the following email:

Jim,

I need the report on my desk by 10:00 a.m.

Or

Dear Jim,

How are you? I hope all is well with you.

I hope that you received all the needed information for the report. As mentioned before, I need the report by 10:00 a.m. Looking forward to reading it...

Best regards,

Michael

These two emails ask for the same action, yet one provides more information and is more personal and polite. In teams, norms can emerge and influence which type of email messages are most likely to be sent. Imagine a group of workers who communicate using messages that are of the same personal style as the second example above. If someone were to communicate a message to this group using a style similar to the first example, it would stand out as being different, likely as “abrupt,” signaling anger. It would have the potential of both surprising and offending others because it violates the norm.

Despite the fact that email is considered to be an informal communication tool, norms of etiquette for writing email differ across organizations, groups, and individuals (Vignovic & Thompson, 2010). Violations of perceived norms have been found to have a negative impact. Stephens, Houser, and Cowan (2009) found that when students' emails

were casually worded, instructors were less likely to comply with students' requests. There is evidence from work on virtual communities that adhering to norms can enhance cohesiveness (Blanchard, 2008). Yet, to the knowledge of the authors, there has been no work investigating the different communication norms that can emerge within PDTs.

Subdivision in PDTs

The geographic separation of members of PDTs can lead to differences in collaboration patterns, and sometimes can induce in-group/out-group patterns that are a drain on efficiency and performance (e.g., Herbsleb, Mockus, Finholt, & Grinter, 2000; Olson & Olson, 2001). One example is the work by Bos and colleagues (Bos, Olson, Nan, & Cheshin, 2009) that demonstrated this subdivision among PDTs using a laboratory-based simulation, *Shape Factory*. Resources were allocated differentially depending on whether the people were collocated or remote. Those who were collocated communicated almost exclusively with collocated members whereas remotes communicated almost exclusively with remotes. Members' bias toward interacting with others in the same media condition persisted even in conditions where it was to their economic disadvantage (Bos et al., 2006). Later research showed that remotes had a lower sense of affective identity compared to those collocated, as well as a lower sense of group efficacy (Bos, Buyuktur, Olson, Olson, & Volda, 2010).

Two likely causes for this bifurcation were communication cost and social preferences. Communication cost was lower among those who were collocated (i.e., Fussell, Kiesler, Setlock, & Scupelli, 2004). Those who were collocated, whom we call “collocateds,” probably showed preference to other collocateds because of social presence which created a feeling of obligation while also encouraging trust. Both of these led to the development of an in-group. Surprisingly, an equally strong in-group bias developed among remotes (Bos et al., 2009). This was unexpected since remotes did not know who the other remote players were. Yet, within a few rounds, driven by the fact that collocateds ignored them, remotes found each other and began preferential collaborations.

We would like to suggest that distinct in-groups might form in part because of differences in *the way* communication channels are used in the media environments. Collocated and remote members may have developed different ECNs that made them prefer to work with those communicating in a similar manner. The creation of two distinct ECNs within the same team might have accentuated differences between individuals in the same team, widening the already present physical divide of PDTs.

Norms and Media Environment

Norms are social regularities that are commonly held by group members and define who belongs to the group

(Turner, 1991). They are noticed by group members and imitated because of the desire to be a member of a group (Elwood, Greene, & Carter, 2003). Implicit norms emerge without specific guidelines or rules and are not openly stated (Kelly, 1955). ECNs, we argue, can be influenced by media environments. Media environments might have rich, responsive media channels (i.e., voice, instant messaging, and video conferencing) or could have only lean, asynchronous channels (i.e., letters, emails) (Daft & Lengel, 1986). As will be elaborated below, we argue that different media environments can lead to the emergence of distinct implicit ECNs which further divide subgroups.

Computer-Mediated Communication and Teamwork

Despite the fact that social cues are harder to convey when communicating electronically over distance, teams that use CMC develop relationships comparable to teams communicating FtF (Sproull & Kiesler, 1986); although they might take longer to develop (Walther, 1992, 1994). In some cases CMC has been found to lead to more cohesive teams. The anonymity and sense of de-individuation involved in some forms of CMC may reduce one's sense of self, increase group identification (Spears, Postmes, Lea, & Watt, 2001), and increase the adherence to group norms (Postmes, Spears, & Lea, 2000).

The presence of communication channels – specifically visual contact – can either increase or diminish a group's performance depending on whether one identifies with the group. Identification can be stronger when one is invisible. Spears, Lea, and Lee (1990) found that team members with strong social identities displayed more polarization when they had FtF contact than when they did not. Thus, strong identification with a group can override the lack of social cues offered by CMC, and at times might even help teammates to accentuate what they have in common (Mortensen & Hinds, 2001).

Theories on group collaboration, such as the Social Identity Theory (Tajfel & Turner, 1986) or the Group Engagement Model (Tyler & Blader, 2003), highlight the importance of norms, but do not further explore the effects of CMC and FtF on those norms. Cramton (2001) demonstrated how norm violations in virtual settings led to more negative personal attributions than situational attributions. People blame others' personality flaws rather than excuse them because "something came up." These dynamics can accelerate small rifts caused by other differences, such as different locations and contrasting ECNs.

Why Would Different ECNs Develop?

Individuals differ in how much they say, and the extent to which they cognitively elaborate on communicated messages (Petty & Cacioppo, 1986). Elaboration, for

example, involves writing messages that reflect consideration of the context in which the message is sent, such as wishing the recipient well, acknowledging how busy he or she might be, etc. Because these extra considerations require effort, many individuals avoid doing so. The Elaboration Likelihood Model (ELM) acknowledges the differences between high and low elaboration. In one case ("central"), the context of messages is carefully considered by recipients; in the other case ("peripheral"), people use "quick and dirty" heuristics, or simple decision rules, to evaluate and respond to messages. The choice is determined by one's motivation and ability (Petty & Cacioppo, 1979; Petty, Wells, & Brock, 1976).

The ELM model has important implications for PDTs. Collocated team members have two media channels with an abundance of information to deal with that may lead to high cognitive load. A common response would be to process some information lightly (peripheral) and other more seriously (central). It is likely that collocateds will attend to FtF messages with collocated peers more extensively, and process CMC messages lightly. This ECN might persist even when collocateds communicate with remotes. In contrast, remote team members will be fully focused on CMC messages. They might be more able and willing to devote processing resources to CMC because it is their only means of communication. The leaner medium of CMC (Daft & Lengel, 1986) could lead one to use more words, read more messages, and provide more context when communicating. There might also be differences in the content of messages sent. Those who are collocated might discuss events experienced together in their location in conversation, while those who are remote might say more in text to try to build rapport and compensate for the lack of nonverbal cues and shared context. The possibility of distinct ECNs emerging in PDTs creates a communication challenge, unseen in either wholly collocated or virtual teams.

The Studies

In what follows, we describe results from two studies in which we create PDTs that engage in a simulated work setting, where individuals must work together to share resources and accomplish related goals. In the first study, we examine traces of communication to discover that ECNs developed and are visible via the amount of message traffic as well as message content. We then examine the traces in the second study, looking for evidence that these are actually *norms* versus merely situated, preference based, behaviors.

Study Settings

In both studies we set up PDTs where remotes have one media environment (communicating through email) and collocateds have an additional FtF channel for communication with those collocated. We measure the development of ECNs by examining their use of email. We focus on the number of messages sent, actual use of text, followed by

the frequency of reading of CMC, and finally on the topics and other information communicated in the text messages. Based on the above we predict the following:

Hypothesis 1: Remotes and collocateds will develop different electronic communication norms.

Compared to collocated members:

Hypothesis 1a: Remotes will *send* more messages.

Hypothesis 1b: Remotes will *read* more text messages sent to them.

Hypothesis 1c: Remotes will send *longer* text messages.

Hypothesis 1d: Remotes will convey *different content* in text messages.

Study I

Method

Our participants engaged in a serious game called *Shape Factory* which has been used previously to study in-group/out-group formation and communication patterns (e.g., Bos et al., 2009; Cheshin, Rafaeli, & Bos, 2011). This experimental task recreates a number of features of modern knowledge work: flexible collaboration with some choice of collaborators, multiple project demands occurring in parallel, scarce resources, and time pressures. Imagine a programming team, where each member is an expert in one area, for example, graphic design, layout, debugging, etc. Each team member can perform all tasks, but it would be more efficient for each member to work on his or her area of expertise. Yet, as is the case in most work settings, there are not enough resources to assist everyone, and at times individuals need to work on tasks that are not in their area of expertise. Furthermore, because there are several people with the same expertise, it is efficient to establish a trusting relationship with at least one, so that future requests for help are responded to. Shape Factory simulates such a situation.

Procedure

In each of our 13 groups, ten participants were randomly assigned a color, shape, and location. Five participants were assigned to be in one room ("collocateds") while five others were put into separate rooms ("remotes") – creating a PDT. Each participant was associated with a colored shape such as "blue square" representing an identity (blue) and a specialty (square). There were a total of five shapes (square, circle, diamond, X, and triangle) with the two specialty producers of each being distinguished by their color (e.g., red square and blue square). All shapes were represented in the room and all shapes were remote (see Figure 1).

Figure 1. Configuration of collocated and remote participants.

Each session consisted of five rounds, each lasting 15 min except for the first round. The first round was 20 min long to provide participants time to adapt to the simulation. Participants were informed of the length of each round. Before the experiment, participants reviewed the task instructions and were quizzed to verify understanding of the rules.

During each round participants were tasked with putting together different orders consisting of different length strings of various shapes, each participant with a different set. Participants earned payoffs by completing orders, with longer orders having increasingly higher payoffs. A participant could produce his or her own specialty shape cheaply; other shapes cost more to produce. There was no payoff advantage in making all the needed shapes by oneself. It was more cost effective to buy the parts from those who could make them more cheaply. Participants benefitted by working together, requesting to buy (and sell) shapes from (to) the other shape producers.

In each round there were more shapes needed for the orders than could be made by the players on the team, creating scarcity. This setting created a mixture of competition (over resources) and cooperation (exchanging parts) to achieve everyone's needs. Using the Bell and Kozlowski (2002) categorization scheme, the task can be considered *intensive* because it involves a complex workflow.

Subjects played the web-based game on identical laptops. In the game, all transactions (requests and deliveries) had to go through the computerized messaging system; all essential transactions could be done by selecting items from menus or numerical entries (see Figure 2). There was a box for optional additional text, and it was possible to send messages that were nothing but open text. Messages arrived in participants' inboxes with an informative subject line, allowing participants to quickly process incoming messages (see Figure 3). It was possible to complete tasks without ever reading or writing optional messages.

Collocateds could communicate FtF or exchange text messages through the emailing system, whereas remotes could only interact via text messages. This created two different media environments for different subsets of the same team. For example, while an official request and delivery of a shape had to go through the electronic system, collocateds often negotiated deals orally with each other in the room, a communication option not available to the remotes.

Figure 2. Shape factory message – an example of a request form. *Notes.* In a request form, a requester needs to specify the request receiver, asking price, and the quantity of items. Writing a text message is optional.

☐ request	▲	■	1	22	04:40 PM
negotiation	■	▲	1	26	04:41 PM
negotiation	▲	■	1	26	04:42 PM
☐ request	●	■	3	25	04:43 PM
negotiation	■	●	1	26	04:45 PM
☐ request	×	■	1	27	04:45 PM
delivery	■	×	1	27	04:47 PM

Figure 3. Shape factory inbox. *Notes.* The inbox provides the summarized history of transactions. One can view the detail of a transaction by clicking on the hyperlink.

Subjects

One hundred thirty participants in groups of ten were recruited via advertisements and an email list (52% females, mean age = 22.31, 97% students). Over 99% of the participants had used computers and the Internet for more than 3 years and used email regularly. They received \$15 as base payment plus a bonus of up to \$10 based on their performance in the game.

Data Analysis

To investigate Hypotheses 1a, 1b, and 1c, we estimated a longitudinal and multilevel model using a mixed effect model in SPSS. A mixed model takes into account the multilevel

structure of our data with multiple observations (sender-receiver communication) within each communication condition in each group. Group membership and dyadic-communication IDs (e.g., Exp40.pink-blue) were included in the model as random effects, accounting for the likely violation of homogeneity of variance and controlling for unobserved heterogeneity. Z-scores were calculated for the three dependent variables: The number of messages sent (H1a), the ratio of messages viewed out of all messages received (H1b), and the number of words in the messages sent (H1c).

To test H1d, we examined the content of text messages, the topics covered, and the information included. The text messages were evaluated and coded into different categories based on their content. Table 1 shows the entire set of 39 categories in the coding scheme, which was then collapsed into a 12-category scheme. Raters reached a sufficient interrater agreement (Cohen's $K = .85$).

Results

In sum, there were a total of 13,257 messages exchanged across 13 sessions; 5,096 of the messages contained text. Using Bonferroni's pairwise comparisons, we compared the sending, opening, and writing of text messages and content of messages across four sender-receiver communication conditions (remote → remote, remote → collocated, collocated → remote, and collocated → collocated).

Number of Messages Sent

A significant difference was found in the number of messages sent. Remotes sent more messages than collocateds irrespective of recipient, $F(1, 4491) = 10.63$, $p < .01$; see Table 2, supporting H1a.

Opening/Reading Text Messages

A significant difference was found regarding the opening of text messages to enable reading them. Remotes opened significantly more messages than collocateds, $F(1, 4519) = 57.89$, $p < .001$; see Table 2, supporting H1b.

Writing Longer Messages

A significant difference was found in the length of messages exchanged between remotes and collocateds. Remotes wrote significantly longer messages than collocateds, $F(1, 4502) = 53.00$, $p < .001$; see Table 2, supporting H1c.

Content of Communication

Tables 3 and 4 report the results of our content analysis of text messages based on the 12-item coding category scheme (Table 1). On 10 different categories, we found

Table 1. Complete coding scheme

Collapsed category	Specific code
Positive	Politeness
Positive	Help/answering questions/ providing info
Positive	Friendly chat about the game
Positive	Humor
Positive	Positive nickname
Positive	Friendly chat about nongame issues
Positive	Tips
Positive	Mentioning strategy
Positive	Ingratiating
Oral redundancy/verbal	Verbally requesting a part
Oral redundancy/verbal	Asking for opinion on buying offer
Oral redundancy/verbal	Verbally accept a deal
Oral redundancy/verbal	Verbally declining
Identity disclosure	Mentioning other participants' shape or color
Identity disclosure	Mentioning their own shape or color
Negotiation type	Negotiation price
Negotiation type	Negotiation amount
Negotiation type	Only if you do then I will
Negotiation type	Begging
Negotiation type	Negotiation mentioning of others
Negotiation type	Third-party involvement
Reason	Reason behind action
Checking on transaction	Checking on transaction
Disclosure	Asking for info
Disclosure	Mentioning of condition
Disclosure	Asking for production cost/score info
Reciprocity	History of transaction
Reciprocity	Future transaction next round
Reciprocity	Future transaction this round
Proactive	Offering your parts to others
Negative	Lying
Negative	Rude
Negative	Voicing frustration
Negative	Sarcastic
Negative	Trash talking about others
Negative	Threat
Time related	Creating urgency
Other	Other

significant differences between remotes and collocateds. Remotes used more positive expressions, $F(1, 5094) = 74.4$, $p < .01$, had more redundancy in their messages, $F(1, 5094) = 39.9$, $p < .01$, included more identity information, $F(1, 5094) = 7.5$, $p < .01$, provided more reasoning for their actions, $F(1, 5094) = 22.5$, $p < .01$, checked on transactions more often, $F(1, 5094) = 31.3$, $p < .01$, wrote more about reciprocity, $F(1, 5094) = 7.7$, $p < .01$, conveyed urgency more often, $F(1, 5094) = 13.9$, $p < .01$, yet were less proactive in offering their shapes to others who were not collocateds, $F(1, 5094) = 2.1$, $p < .01$, supporting H1d.

Overall, results indicate that two distinct ECNs emerged in PTDS. Remotes wrote more (H1a), opened more messages (H1b), used more words (H1c), and communicated different information in their text messages (H1d). This demonstrates how a messaging system for a team was used differently by members based on the media environment, leading to differing ECN, supporting H1.

Discussion

Overall we found stark differences between remotes and collocateds, supporting the emergence of different implicit ECNs in PDTs. Remotes sent, opened (and presumably read), and wrote longer CMC messages. Content of messages differed in aspects of positivity, redundancy, and disclosure as well as other aspects which indicates that the use of the messaging system was different between media environments. However, one might argue that what we have demonstrated is not a norm difference but rather differences in behaviors shaped by ease of communication or in-group preference. Norms are not simply differences in behavior; they are persistent ways of interaction that members adhere to and expect others to do so as well (Kelly, 1955). We posit that if group members were to keep their CMC patterns when they were moved to a different media environment, it would be an indication that the differences we observed are indeed norms, and not merely preferences or a result of ease in the current situation. To investigate this we conducted a second study, where some participants, after completing more than half of the task in a specific media environment, were moved to a different media environment. If indeed we are depicting the emergence of norms, these norms should be maintained even when media environment changes.

Table 2. Number of messages sent, number of messages opened, and length of messages (z-scored)

	Collocated–collocated	Collocated–remote	Remote–collocated	Remote–remote	F value
Number of messages sent (from ... to)	-.133 ^a	-.120 ^{ab}	-.010 ^b	.223 ^c	$F(3, 4483) = 32.92^{***}$
Opening/reading text messages (by ... from)	-.089 ^a	.109 ^b	-.143 ^a	.110 ^b	$F(3, 4516) = 19.88^{***}$
Word count of a message (from ... to)	-.205 ^a	.017 ^b	.051 ^{bc}	.115 ^c	$F(3, 4460) = 31.52^{***}$

Notes. All three measures are z-scored. From (the first member of the pair) to (the second member); by (the first member of the pair) from (the second member). Different superscript letters indicate significant differences between conditions at $p < .05$. *** $p < .001$.

Table 3. Message code categories, examples, and frequencies by media environment (Study I)

Message type	Example	Col	Remote	Significance
Positive message	“Thanks for the deal!”	9%	19%	$F(1, 5094) = 74.4^{**}$
Oral redundancy with subject line	“Pls send me two circles.”	11%	17%	$F(1, 5094) = 39.9^{**}$
Identity formation/disclosure	“Hey purple circle, what do you think”	11%	13%	$F(1, 5094) = 7.5^{**}$
Negotiation of price or amount	“Not less than 19 sorry”	6%	7%	Not significant
Reason behind action	“Please sell me this since I am asking for a large quantity from you”	4%	7%	$F(1, 5094) = 22.5^{**}$
Check transaction	“Pls keep ur promise =)”	4%	6%	$F(1, 5094) = 8.6^{**}$
Disclosure or asking for disclosure	“How much is your diamond?”	2%	5%	$F(1, 5094) = 31.3^{**}$
Reciprocity	“Let’s get on good terms again”	2%	3%	$F(1, 5094) = 7.7^{**}$
Proactive	“selling x’s for 20”	3%	2%	$F(1, 5094) = 2.1^{**}$
Negative/frustration	“If you can’t make my squares can you please tell me at least”	1%	2%	Not significant
Time/urgency	“Let me know as soon as you can!”	<1%	1%	$F(1, 5094) = 13.9^{**}$
Other		<1%	2%	$F(1, 5094) = 23^{**}$

Notes. Columns do not sum to 100% because a message can be given no code or more than one code. $^{**}p < .01$.

Table 4. Message code categories, examples, and frequencies. By sender and receiver (Study I)

Message type	Example	Remt–Remt	Remt–Col	Col–Remt	Col–Col	Significance
Positive message	“Thanks for the deal!”	19% ^a	18% ^a	13% ^b	5% ^c	$F(3, 5092) = 33.36^{**}$
Oral redundancy with subject line	“Pls send me two circles.”	17% ^a	17% ^a	10% ^b	11% ^b	$F(3, 5092) = 13.36^{**}$
Identity formation/disclosure	“Hey purple circle, what do you think”	13%	14%	11%	10%	$F(3, 5092) = 2.54^{\dagger}$
Negotiation of price or amount	“Not less than 19 sorry.”	8%	6%	7%	5%	$F(3, 5092) = 2.10^{\dagger}$
Reason behind action	“Please sell me this since I am asking for a large quantity from you.”	7% ^a	7% ^a	5% ^a	2% ^b	$F(3, 5092) = 10.77^{**}$
Check transaction	“Pls keep ur promise =)”	6% ^a	6% ^a	5% ^{a,b}	3% ^b	$F(3, 5092) = 4.90^{*}$
Disclosure or asking for disclosure	“How much is your diamond?”	5% ^a	6% ^a	3% ^b	2% ^b	$F(3, 5092) = 11.84^{**}$
Reciprocity	“Let’s get on good terms again.”	4% ^a	2% ^b	2% ^b	1% ^b	$F(3, 5092) = 9.04^{**}$
Proactive	“Selling x’s for 20”	2%	2%	3%	3%	Not significant
Negative/frustration	“If you can’t make my squares can you please tell me at least!”	2%	2%	2%	1%	Not significant
Time/urgency	“Let me know as soon as you can!”	1% ^a	1% ^a	<1% ^{a,b}	<1% ^b	$F(3, 5092) = 4.68^{**}$
Other		2% ^a	1% ^a	<1% ^b	<1% ^b	$F(3, 5092) = 8.21^{**}$

Notes. Columns do not sum to 100% because a message can be given no code or more than one code. Different superscript letters indicate significant differences between conditions at $p < .05$. $^{\dagger}p < .10$. $^{*}p < .05$. $^{**}p < .01$.

Study II

Study II had the same setting as Study I, yet after the third round, two participants from the collocated room switched places with two remotes for the remaining two rounds. The same shapes were switched (i.e., blue-square with orange-square) to keep the availability of resources identical across media environments. Participants were *not* informed of this change beforehand. If participants had not developed a norm, and were simply responding to task constraints, we

would expect a very rapid or immediate change in communication patterns after switching. If they had to some extent internalized the ECNs, we would expect to see some persistence of their old habits and some delay in adapting to the new environment. Thus:

Hypothesis 2: After changing their media environment part way through an experiment, traveling participants will retain the ECNs that emerged in their original media environment.

Compared to the people who remained in their locations:

Hypothesis 2a: Traveling participants will keep the ECNs developed in their original location regarding *sending* messages.

Hypothesis 2b: Traveling participants will keep the ECNs developed in their original location regarding *reading* messages sent to them.

Hypothesis 2c: Traveling participants will keep the ECNs developed in their original location regarding the *length* of text messages.

Hypothesis 2d: Traveling participants will keep the ECNs developed in their original location regarding the *content* of their text messages.

Method

Study II had an identical procedure to Study I, with the addition of the switching of four participants after the third (of five) rounds.

Subjects

Thirteen groups of ten participants were recruited using the same means as in Study I (50% females, mean age = 22.97, 95% students).

Results

Number of Messages Sent

Pre-Intervention

Consistent with Study I, we found significant differences between remotes and collocateds in the number of messages sent before the switch, $F(3, 2677) = 14.5$, $p < .001$; see Table 5. Moreover, remotes wrote more messages than did collocateds, regardless of receiver, $F(1, 2680) = 43.3$, $p < .001$.

Post-Intervention

We conducted pairwise comparisons of those who were switched and those who were not, taking into account the recipient. The number of messages sent by traveling remotes, who moved into the room and became collocateds, was compared to that sent by permanent remotes. As shown in the top comparisons in Table 6, traveling remotes (now collocated) did not differ statistically from remotes who did not travel in Round 4; yet at Round 5 the difference became significant. The number of messages sent by traveling collocateds (now remotes) was compared to that sent by permanent collocateds in Rounds 4 and 5 (bottom comparisons in Table 6). Traveling collocateds did not differ statistically from collocated who did not travel, in this aspect, after the switch (Round 4). Concerning the writing of

Table 5. Number of messages sent, number opened, and length of messages (z-scored)

Rnd	Pairwise comparisons	Col-Col	Col-Remt	Remt-Col	Remt-Remt	Significance
1-3	Number of Messages Sent (from ... to)	-.193 ^a	-.185 ^a	.043 ^b	.058 ^b	$F(3, 2677) = 14.45^{***}$
Intervention						
4-5	Number of Messages Sent (from ... to)	-.088 ^a	-.174 ^a	.290 ^b	.293 ^b	$F(3, 1706) = 9.74^{***}$
1-3	Opening/reading Text messages (by ... from)	-.002 ^a	.172 ^b	-.079 ^a	.126 ^b	$F(3, 7218) = 24.58^{**}$
Intervention						
4-5	Opening/Reading Text Messages (by ... from)	-.113 ^a	-.229 ^b	.000 ^a	.018 ^b	$F(3, 2645) = 2.54^*$
1-3	Word Count of a Message (from ... to)	-.328 ^a	-.010 ^b	.073 ^{b,c}	.203 ^c	$F(3, 2647) = 40.11^{***}$
Intervention						
4-5	Word Count of a Message (from ... to)	-.412 ^a	.118 ^{b,c}	.085 ^b	.363 ^c	$F(3, 1689) = 13.60^{***}$

Notes. All three measures are z-scored. After the intervention (R4-5), remote sender refers to only non-traveling (permanent) remotes and collocated sender refers to only non-traveling (permanent) collocateds. On comparison, remote receiver includes both permanent remotes and traveling collocateds (who newly became remotes) and collocated receiver refers to both non-traveling (permanent) collocateds and traveling remotes (who newly became collocateds). Different superscript letters indicate significant differences between conditions at $p < .05$. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 6. Bonferroni pairwise comparisons between traveling and non-traveling groups after the traveling intervention (Study II)

Pairwise comparisons	Round	Perm remote → remote	Mean diff.	Traveling remote → remote
		(mean std dv)		(mean std dv)
Number of messages sent (from ... to)	4	(.162 .082)	=	(−.091 .107)
	5	(.466 .095)	>	(−.089 .127)
Opening/reading text messages (by ... from)	4	(.105 .97)	=	(−.095 1.02)
	5	(.018 1.00)	=	(−.120 1.02)
Word count of a message (from ... to)	4	(.460 .087)	=	(.075 .115)
	5	(.281 .083)	=	(.072 .112)
		Perm remote → col	Mean diff.	Traveling remote → col
Number of messages sent	4	(.343 .084)	=	(−.064 .104)
	5	(.217 .099)	>	(−.278 .120)
Opening/reading text messages	4	(.028 .99)	=	(−.043 1.01)
	5	(.000 1.00)	=	(−.101 1.02)
Word count of a message	4	(.053 .091)	>	(−.461 .110)
	5	(.101 .087)	>	(−.540 .105)
		Perm col → col	Mean diff.	Traveling col → col
Number of messages sent	4	(−.125 .082)	=	(.269 .099)
	5	(−.034 .098)	=	(.326 .119)
Opening/reading text messages	4	(−.140 1.02)	=	(−.032 1.01)
	5	(−.113 1.02)	=	(−.108 1.02)
Word count of a message	4	(−.384 .087)	<<	(.115 .107)
	5	(−.432 .085)	<	(.043 .105)
		Perm col → remote	Mean diff.	Traveling col → remote
Number of messages sent	4	(−.204 .089)	=	(.139 .100)
	5	(−.123 .109)	<	(.448 .116)
Opening/reading text messages	4	(−.288 1.02)	=	(−.064 1.01)
	5	(−.229 1.03)	=	(−.059 1.01)
Word count of a message	4	(.095 .096)	=	(.179 .108)
	5	(.148 .096)	=	(.262 .102)

Notes. All three measures are *z*-scored. Remote refers to both non-traveling (permanent) remotes and traveling collocates (who newly became remotes) and collocate refers to both non-traveling (permanent) collocates and traveling remotes (who newly became collocates). The sign and significance of the mean difference between the two communication pairs (left and right) on each of the three measures are denoted as the following: = (nonsignificant.), > ($p < .05$), and << ($p < .01$). Arrows represent the sender and receiver relationship.

messages to other collocates, no adjustment was made and no significant difference was found even in Round 5 (which was not the case for the other comparisons). Figure 4 offers a visual representation of the change by rounds. Taken together, these findings indicate stickiness of ECNs after the intervention, supporting H2a.

Opening/Reading Text Messages

Pre-Intervention

Consistent with Study I, we found significant differences between remotes and collocates in opening messages in pre-intervention, $F(3, 7218) = 24.58, p < .001$; see Table 5. Remotes opened messages more frequently than did

collocates, regardless of sender, $F(1, 7220) = 66.3, p < .001$.

Post-Intervention

Traveling remotes were compared to permanent remotes concerning the number of messages opened/read. As shown in the top comparison in Table 6, no significant differences were found between traveling remotes and permanent remotes in both rounds, though it was apparent that travelers had viewed messages less and less frequently over time. Similarly, traveling collocates were compared to permanent collocates concerning the number of messages opened/read (see the last comparison in Table 6). Although traveling collocates opened messages more often after the

Figure 4. Number of messages sent by condition. *Notes.* Each point represents the adjusted z -score of the mean in a given round. Permanent Remote (indicated by the line with the diamond) refers to the remote participants who did not travel. Traveling Remote (indicated by the line with the square) refers to the participants who started the experiment as remotes but became collocateds after the traveling intervention. Permanent Collocated (indicated by the line with the triangle) refers to the collocated participants who did not travel. Traveling Collocated (indicated by the line with the X) refers to the participants who started the experiment as collocateds and became remotes after the traveling intervention.

Figure 5. Opening/reading text messages of messages viewed by condition. *Notes.* Each point represents the adjusted z -score of the mean in a given round. Permanent Remote (indicated by the line with the diamond) refers to the remote participants who did not travel. Traveling Remote (indicated by the line with the square) refers to the participants who started the experiment as remotes but became collocateds after the traveling intervention. Permanent Collocated (indicated by the line with the triangle) refers to the collocated participants who did not travel. Traveling Collocated (indicated by the line with the X) refers to the participants who started the experiment as collocateds and became remotes after the traveling intervention.

switch, the difference between traveling and permanent collocateds was not significant (see Figure 5 for a visual representation of change over rounds). Thus, H2b is supported.

pre-intervention, $F(3, 2647) = 40.11, p < .001$, see Table 5. The overall difference between remotes and collocateds in writing texts, irrespective of receiver, was significant, $F(1, 2660) = 13.9, p < .001$.

Writing Longer Messages

Pre-Intervention

Consistent with Study I, we found significant differences between remotes and collocateds in length of messages sent

Post-Intervention

Traveling remotes were compared to permanent remotes in terms of the length of messages. As shown in the first four comparisons of Table 6, no significant differences were found between travelers and permanent members in both

Figure 6. Word count of a message written by condition. *Notes.* Each point represents the adjusted z-score of the mean in a given round. Permanent Remote (indicated by the line with the diamond) refers to the remote participants who did not travel. Traveling Remote (indicated by the line with the square) refers to the participants who started the experiment as remotes but became collocateds after the traveling intervention. Permanent Collocated (indicated by the line with the triangle) refers to the collocated participants who did not travel. Traveling Collocated (indicated by the line with the X) refers to the participants who started the experiment as collocateds and became remotes after the traveling intervention.

Table 7. Message code categories, examples, and frequencies by sender after travel (Rounds 4)

Message type	Perm remote	Travel remote	Perm col	Travel col	Significance
Positive message	18%	17%	15%	20%	No difference
Oral redundancy with subject line	21% ^a	12% ^b	20% ^a	12% ^b	$F(3, 1993) = 8.75^{**}$
Identity formation/disclosure	15% ^a	6% ^b	12% ^a	10% ^{a,b}	$F(3, 1993) = 6.32^{**}$
Negotiation of price or amount	11% ^{a,b}	6% ^b	7% ^{a,b}	12% ^a	$F(3, 1993) = 3.53^{**}$
Reason behind action	6%	7%	5%	4%	No difference
Check transaction	5%	5%	4%	7%	No difference
Disclosure or asking for disclosure	7% ^{a,b}	3% ^b	4% ^{a,b}	8% ^a	$F(3, 1993) = 3.71^{**}$
Reciprocity	6%	3%	4%	5%	$F(3, 1993) = 2.17^{\dagger}$
Proactive	2%	1%	2%	1%	$F(3, 1993) = 2.59^{\dagger}$
Negative/frustration	2%	1%	1%	2%	No difference
Time/urgency	<1% ^a	2% ^b	<1% ^a	<1% ^a	$F(3, 1993) = 3.63^{*}$
Other	2%	0%	0%	0%	$F(3, 1993) = 7.61^{**}$

Notes. Columns do not sum to 100% because a message can be given no code or more than one code. Different superscript letters indicate significant differences between conditions at $p < .05$. $^{\dagger}p < .10$. $^{*}p < .05$. $^{**}p < .01$.

conditions in both rounds when writing to other remotes. Furthermore, the word counts of messages written by travelers were compared to those written by permanent members when messages were sent to the collocated room in Rounds 4 and 5 (see the last comparison in Table 6). Travelers were found to exhibit significantly different ECNs than permanent members immediately after the intervention. Traveling collocateds (now remote) wrote significantly longer messages while traveling remotes (now collocated) wrote significantly shorter ones to other collocateds than did their remote peers who stayed in their locations (see Figure 6 for a visual representation of change over rounds). Taken together, H2c is partially supported.

Content of Communication

Contrary to the other behaviors, no evidence was found for differences in *content* of messages after moving to a new

media environment. As can be seen in Table 7 differences were found between the conditions in the content of the messages after the intervention; yet these differences were not consistent with our hypothesis, thus H2d is not supported.

All in all, the results provide some evidence that traveling members did not immediately change their electronic communication tendencies after the switch but rather carried over some of their previous ECNs and retained them for a while. Thus, the results from Study II provide some support for H2 and our ECNs arguments.

Discussion

Study II offers confirmation that some aspects of electronic communication tendencies persisted even after individuals were moved to different media environments, providing evidence that a norm for electronic communication had

been established. We demonstrate this across three different behaviors: sending, opening, and writing longer messages, as will be elaborated below. These behaviors differed in their stickiness, some persisting until the end of the interactions – while others eventually changed to the new norms. Thus, it is clear that those who traveled and changed their media environment did not use their electronic channel the way naïve participants did when they started the experiment, and that the emergent norm of communication was sustained, at least for a while.

Participants who started remote and moved to a collocated environment kept their norms of writing more messages at first, but eventually changed their behavior to the local norm. The norm of opening optional text messages was kept regardless of the media environment change. The remotes who opened more messages kept on doing so even after they became collocateds. Collocateds retained their norms of not opening many optional text messages even after becoming remote. This norm was retained throughout the experiment. Remotes continued writing more text in messages even after moving to a room where they had the FtF channel available to them. Those who started the experiment as collocateds continued writing fewer text messages even when they lost the FtF channel and were now reliant solely on the CMC channel. Intriguingly, the norm of writing more text messages did not persist forever. After one round in the new media environment, both traveling remotes and collocateds adjusted to local norms, respectively.

As for the actual content communicated in the optional text messages, no evidence was found for retention of norms. The content did differ between conditions but not in a consistent manner, nor with accordance to the pattern of other norms. We believe that switching of some members was an event that influenced and changed the group, beyond the media environment change. For example, the emotions of members probably altered due to the change. The switch introduced more noise and interfered with the norms concerning *what* to communicate, and as such, norms regarding content of communication did not persist.

Based on our findings in Study II we believe that the differences in behaviors that were found between the media environments are indeed emergent norms. Some norms were stronger than others (e.g., opening messages as opposed to writing messages) and were “stickier.”

General Discussion

A single team with two differing media environments can develop two distinct ECNs. We believe that these differing norms emerge unintentionally, as members in each media environment adopt the most convenient communication channel available. Drawing from the ELM (Petty & Cacioppo, 1986), we find a theoretical rationale for the formation of these two norms. Remotes are exposed to one media environment and are likely to maintain their ECNs in all communication. This is evident from the fact that remotes used more words when sending messages, regard-

less of the location of the recipients. Similar to members of virtual teams, mindful of CMC constraints to team coordination and socialization, remotes in PDTs are likely to make more deliberate efforts to convey contextual information in addition to core messages as evident in the content of messages sent.

From the ELM perspective, remotes take the central route when receiving and sending messages, whereas collocateds must decide which elaboration route to take because they are constantly exposed to two media environments, FtF and CMC. The duality of media environments creates higher cognitive load and presents cognitive and motivational challenges to collocateds' ability and willingness to read and write text messages (Petty & Cacioppo, 1986).

This explains the emergence of these different norms, yet the interesting aspect is that these norms were maintained even after the media environment that caused them to emerge was changed. The participants that switched media environments kept most of their electronic communication patterns, at least when they first arrived to their new location (Round 4) and did not behave in the same manner as those who had started the simulation in that location. Despite the conflict between the different media channels and the elaboration hardships (or ease), travelers kept their tendencies (at least in the beginning) of communication.

Is It Really a Norm?

Study II strengthens our argument that we are indeed dealing with norms that persist (to some extent) when individuals are moved to a different media environment. The ECNs are changeable but sticky. If we were only dealing with the ease of communication actions and not with norms we would have expected travelers to immediately act in the same manner as those who had been working permanently in their new location. This was not the case. Travelers (who left a media environment toward the middle of the task) tended to retain most of the ECNs they had developed earlier; they took their ECNs with them. There was no immediate difference in rates of opening text messages (which tended to be lower for collocated and formerly collocated members) and there was a delayed change in rates of sending messages and the length of text in those messages (collocated and formerly collocated members tended to write less).

Subdivision in Partially Distributed Teams

In the current study we did not measure differences in identity and trust between members of PDTs directly. Evidence for these team subdivisions is present in the work of Bos et al. (2009, 2010) using the same experimental simulation. A location-based bias toward trading of shapes was found, where collocateds traded mostly with collocateds and remotes with remotes.

Other research has demonstrated that differences in expectations across locations in virtual teams might lead to conflicts and reduced motivation (Bosch-Sijtsema, 2007; Hinds & Bailey, 2003). One can imagine that remotes

might find the lack of text messages from the collocateds off-putting, exacerbating the rift of distance. Moreover, CMC has been found to highlight group norms and enhance sensitivity to them more than to FtF interactions, making norm violations more salient in CMC (Lea & Spears, 1992). Thus, when expectations regarding communication are broken by some teammates, it might lead to conflict and reduced motivation to cooperate, heading to the kind of subdivision found in the work of Bos et al. (2009).

We suggest that in PDTs different “dialects” and norms for using CMC make it harder for team members to communicate with one another. These different norms of communication, or communication styles might also be seen as *work-style dissimilarity*. Williams, Parker, and Turner (2007) found that when there is greater perceived work-style dissimilarity, team members are less likely to have positive attributions and feel less empathetic toward coworkers, which in turn leads to subdivisions.

Electronic Communication Norm as a Faultline

Partially distributed teams might rift further apart because the creation of different ECNs acts as an additional faultline. Faultlines are differences that appear within teams and increase chances of conflict and group subdivisions (Lau & Murnighan, 1998). Faultlines have been found to hinder essential team processes such as elaboration on task-relevant information (Homan, van Knippenberg, Van Kleef, & De Dreu, 2007) and outcomes such as quality of decision and social integration (Rico, Molleman, Sánchez-Manzanares, & Van der Vegt, 2007). Originally defined as consisting of visible demographic differences (especially when diversity is moderate and not extreme), other work has extended the concept of faultlines, noting three additional sources of diversity – (1) informational, (2) social, and (3) value (Cramton & Hinds, 2005). Polzer, Crisp, Jarvenpaa, and Kim (2006) specifically tested geographically dispersed teams, suggesting that there are “location-based faultlines” (p. 680). Location-based faultlines are related to the notion of the physical presence of others. Members in the same location are likely to share experiences above and beyond the task they complete, fostering greater familiarity and forming deeper relationships than those who are remote, a situation that is likely to accentuate faultlines. We extend and build on this argument, suggesting the creation of a new faultline which is based on ECNs differences.

Different than the location-based faultline, the ECNs faultline is caused by the different styles, or dialects, members use to communicate electronically. They are not caused by the location differences, but by the media environment differences. Teams that are situated in the same location, but include members who have access to different communication tools can develop these differences in norms. For example, if some members in the same office building use instant messenger and others do not, difference in ECNs might emerge.

Lau and Murnighan (1998) argued that team members who share one or more attributes with other teammates tend to align themselves on the basis of the attribute(s), leading to salient subgroups, which may become a basis for subgroup categorizations, “us” and “them.” When multiple attributes align, the faultline is deemed stronger due to differences between subgroups becoming more obvious (Lau & Murnighan, 1998; van Knippenberg, De Dreu, & Homan, 2004). Thus, PDTs have an inherent location-based faultline and might be at risk of developing an additional ECNs faultline. In our case, not only are teammates located in a different location, they also communicate using different norms. Such subgroup categorizations can harm groups by lowering cooperation, commitment, and rendering group members as less trust worthy while increasing interpersonal tensions and conflict (for a review, see van Knippenberg & Schippers, 2007).

We argue that it is not necessary to have a PDT for these effects to occur. They might appear any time when there are different media environments within a team. Within virtual teams that had both phone and email, but were spread across many time zones, one might observe in-group effects among those who could collaborate synchronously (by phone) and disconnects with those whose workday was misaligned and had to rely only on asynchronous communication. Members of collocated teams might form differing ECNs for use of text messages and smartphones, causing a rift. The key element in producing these effects is not any particular combination of technologies, but rather any difference in type and quality of communication media chosen by a subsection of a larger team, and the development of norms through the use of those channels.

Limitations and Future Research

The current study did not use questionnaires to measure psychological variables (e.g., identification, expectations, goals). These measures might have been useful in better understanding psychological processes underlying the building of norms and use of CMC and their consequences. For example, aspects of empathy toward coworkers have been found to be influenced by dissimilarities in work styles (Williams et al., 2007), which could have been the case here as well. Subsequent research using the same experimental paradigm has found differences in group identity and group efficacy as a result of geographic location (Bos et al., 2010).

As in any laboratory study, factors such as prior relationships and real life events that might have an impact in the field were lacking here. The communication orientation in our study was mixed: the task was interdependent and cooperative in nature, yet it involved competition over resources. As demonstrated by Swaab et al. (2012) the communication orientation could have an effect on group outcomes.

The simulation used a simplification in choice of technologies available. The simulated remotes had limited technology available – asynchronous text messages only.

While some collaborative work is done this way, most remotes would have other options such as phone, voice over IP, or instant messaging. Still, different ECNs could occur any time PDTs have different technologies available in different locations.

Unfortunately, we were not able to capture the verbal communication between collocated participants in this experiment. This left our report on the communication of collocateds incomplete as we only had recorded evidence of their CMC. Future studies should capture and code verbal communication adding more depth, and looking at a more complete picture.

Possible Remedies Following our Findings

The ECNs in our study emerged implicitly. There were no guidelines provided, nor was there a set of rules that would have made these norms explicit. It might have been possible to disrupt this emergent norm by dictating explicit norms for the whole team regarding CMC. There is evidence that creating a set of explicit rules or norms for communication (e.g., frequency of communication, message acknowledgment) can enhance trust in virtual teams (Walther & Bunz, 2005). Thus, the creation of explicit ECNs for PDTs could have two positive effects.

Conclusion

Two distinct ECNs emerged in one team based on the communication options open to them (i.e., the media environment in which they resided). Teams that had more than one communication norm might be more vulnerable to subgroup divisions. Managers should be aware of the tendency of those in different media settings to develop explicit communication norms. Ensuring consistency in team communication norms may decrease disconnects and conflicts, and promote efficient collaboration across distance.

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