

The Rules of Virtual Groups

Joseph B. Walther
Cornell University
joe.walther@cornell.edu

Ulla Bunz
Rutgers University
bunz@scils.rutgers.edu

Natalia N. Bazarova
Cornell University
nmb8@cornell.edu

Abstract

Concerns about virtual groups include how members develop trust and liking for partners. Previous studies have explored behavioral variables leading to subjectively-experienced trust and/or liking, or trusting behaviors that are associated with group productivity. Drawing on practices described elsewhere and deriving principles from social information processing theory of computer-mediated communication, this research identified a set of communication rules for virtual groups. A quasi-experimental procedure promoted variance in rule following behavior, allowing assessment of rules in an inter-university course. Six rules were assessed through self-reported measures, and results reveal correlations between each rule and trust and liking. Less consistent are the relationships between rule-following and actual performance. Results suggest that either a powerful set of rules has been identified, or that rule-following per se reduces uncertainty and enhances trust in distributed work teams.

1. Introduction

A surge of research interest in, and increasingly widespread adoption of distributed work in various settings indicates a growing popularity of virtual teams supported by modern communication technology. Understanding the promise and the problems of these sociotechnical systems can inform contemporary theory in the areas of new technology, group communication, and social psychology, while informing management and shaping applications such as distributed learning groups and virtual organizations. Even though the concept of distributed work is not new [see for review 1, 2], new perspectives on enduring social dynamics come into view from the vantage point of electronically-connected teams.

A longstanding concern in understanding the prospects for virtual groups is how their members develop trust and liking for their partners. Several previous studies have explored behavioral variables

leading to subjectively-experienced trust and/or liking, or trusting behaviors that are associated with group productivity. A second concern in our understanding of distributed groups is to identify the kinds of communication behaviors that facilitate effective interaction, positive affect, and group performance. A number of researchers have examined ad hoc behaviors [e.g. 3] or examined behaviors post hoc [e.g. 4]; fewer have deliberately instigated communication behaviors in virtual group settings in order to evaluate their impact. Drawing on the best practices of virtual groups described in several studies, and deriving additional rules from social information processing theory of computer-mediated communication (CMC) [5], this research employed a quasi-experimental procedure to increase the variance in rule following behavior, so that the utility of some of these best practices could be assessed.

This research analyzes several processes identified by previous research as important for successful virtual teamwork despite the challenges proffered by mediated communication and geographic dispersion of team members, and their impacts on trust, relationships, and performance.

1.1. Virtual teams

Virtual teams are comprised of group members who collaborate from different locations using communication technology. Virtual teams can offer flexibility, responsiveness, and diversity of perspectives in ways that differ from traditional groups. Despite these benefits, however, virtual teams encounter numerous challenges due to their dispersion and communication limitations, which can impede their effectiveness, or at least require great efforts to accommodate to the virtual environment and virtual partners.

1.1.1. Impacts of virtuality. Geographic dispersion among group members incurs a number of disruptive effects. These include incongruities in work environments and social structures, dissimilar organizational cultures, and temporal differences associated with different locations. Any or all of

these can create disparity in working contexts for team members and disrupt the work-flow and shared experience of such groups [6].

Communication media, and the limitations of the CMC used by virtual teams, are also characterized as problematic. Nardi and Whittaker [7], for example, argue that proximity and face-to-face interaction are critical for establishing collaborative interpersonal relationships built on non-task communication early in working partners' interactions. In subsequent interactions, Nardi and Whittaker argue, collaborators need full-cue communication in order to detect when partners are paying attention, listening, and exhibiting backchanneling behaviors, which CMC does not readily provide [see also 8].

The potential problems from dispersion and media may affect a variety of outcomes, such as relational communication and trust, as well as the productivity and quality of the group's work. Relational communication pertains to the reciprocal processes of how group members regard one another and how they express that regard. The dimensions of this regard include their affection, cohesion, and task-versus social orientation, among other themes. Several prominent approaches to the effects of CMC have argued that since relational cues are normally conveyed nonverbally in traditional communication, the relative absence of nonverbal cues from email and computer conferencing occlude the expression of interpersonal dynamics. As a result, it has been argued, CMC may make it difficult, if not impossible, for the development and detection of relational aspects critical to the social dimensions of group work [see for review 9].

Trust is another relational dimension that has significant import for virtual teams, and one that has received particular attention in the virtual teams literature. Handy [10] asserted that trust cannot be maintained in virtual teams. According to Jarvenpaa and Leidner [11], trust is traditionally considered to be based on "personal relationships and past or future memberships in common social networks that define the shared norms of obligation and responsibility," which may not fit the conditions of virtual teamwork. Other conceptualizations of trust fit CMC better; trust in CMC "refers to an expectancy held by an individual or a group that the word, promise, or verbal or written statement of another individual or group can be relied upon" [12, p. 718]. In the CMC literature trust has been found to be positively related to performance [13, 4], problem solving and uncertainty resolution, as well as social information exchange [11], and liking [14]. As with other relational dynamics, trust has been asserted and found to diminish with the relative lack of visual and vocal cues that text-based CMC implies [e.g. 15, 16].

Finally, the quality of CMC groups' output may be suboptimal compared to their face-to-face (FtF) counterparts'. This may be due to dynamics related to the relational aspects discussed above, or due to discretionary participation with asynchronous participation, free-riding, difficulty integrating information, or other information-processing aspects of virtual work [see e.g. 17]. A meta-analysis of such results, however, was inconclusive [18].

In sum, a number of problems associated with distance and restricted communication media have been alleged to impact the ability of distributed groups to function as effectively as FtF groups. From one perspective these disparities may seem insurmountable, if the constraints of distance and media are relatively impervious. However, other research has indicated that the bases for the presumably deleterious effects of distance and media are more permeable. Accommodations may emerge or be applied by which participants adjust to the alternative environment, and the bases of the relational dynamics themselves may change.

1.1.2. Accommodations to virtuality. Alternative approaches and several specific findings challenge the contention that virtual groups are impotent with regard to relational dynamics, trust, and performance. These alternatives also suggest possible strategies for the deliberate remediation of virtual groups' potential problems.

Walther's social information processing theory [5] predicts that CMC users adapt to the medium's restriction of nonverbal cues by imbuing their text-based messages with both task and social information. Due to the real decrements in carrying capacity of the CMC medium, computer-mediated exchanges require more frequent interactions and/or more time in order for users to accrue the task and social information about partners to reach the level of relational development that FtF partners accomplish more quickly. Given enough time, however, long term CMC groups can and do achieve liking, trust, and sociable states [20; see for review 9]. Indeed, whereas short-term CMC group members benefit from seeing pictures of one another in order to hasten their social attraction, group members who exchange a number of messages over time, with no photos to help them, like each other more than short term groups, and more than they do if they eventually see each others' pictures [21].

In line with this notion of accrual, Weisband and Atwater [19] compared experimental CMC and FtF groups on the members' degree of liking for one another. They found a significant correlation in CMC groups between the frequency of a member's task-

related message postings and the degree to which other members liked the contributor. In FtF groups there was no such relationship. The authors concluded that liking in off-line groups is based on non-rational or non-task bases of attraction, whereas in CMC task-oriented groups, people like those more who contribute more to the group's endeavor. One application of this finding may be to encourage virtual group members to communicate task contributions very frequently.

Both the Weisband and Atwater [19] results and those of Walther and colleagues suggest that accumulated messaging leads to greater liking. It is unclear whether messages must be task-related, socially-related, or whether either will do. Both have been implicated in the literature [e.g. 22]. Thus, another implication may be to encourage frequent exchange of social and sociable messages, in addition to task messages. A research question addresses this issue:

What are the relative effects of socially- and task-related messages on affective and substantive outcomes in virtual groups?

As suggested above, trust is also an important variable in virtual groups. Like the effects of time and message accrual on group liking, trust develops over time in longer-term virtual groups consistent with social information processing theory [20, 23]. In other approaches, Jarvenpaa and Leidner [11] distinguished between swift trust and alternative, developmental trust that may develop in online groups. Swift trust is conceived as a depersonalized action based on categorically-derived information and stereotypical assumptions about virtual partners and their behavior. It resembles enduring trust, but it is interpersonally untested [24]. In other words, before having interpersonal knowledge with which to make a decision about the trustworthiness of specific colleagues, partners act as though they trust one another based on a presumption of trustworthiness, at least until shown they should not.

Jarvenpaa and Leidner [11] argue that online trust is not as depersonalized or categorically stereotypical as swift trust. Rather, it may be more behaviorally based, inferred from observations about other members' electronic communication. These researchers facilitated 29 global, virtual student teams comprised of 6 to 8 members over six weeks' time. Participants completed self-reported measures of trust after a median time period and at the end of the teams' work. On the basis of these measures the researchers classified teams as high or low in trust, and then analyzed the transcripts of teams' interactions post hoc in order to identify behaviors common to trusting and untrusting teams. Analyses suggested that team members with the highest levels

of trust had been sociable, exchanged intensely frequent messages, showed interest in other members' responses, showed initiative, provided substantive feedback to one another, and notified others of their expected participation periods or absences. Those with the lowest levels of trust exhibited little initiative and had little social content in their messages. Groups with moderate trust levels had predictable but infrequent communication, focused their messages on tasks only, and devoted a disproportionate level of messages to establishing rules and procedures.

Further analyses led Jarvenpaa et al. [4] to specify several antecedents of enduring trust in online groups. Their findings confirm that in online relationships trust is maintained through performance consistency rather than cognitive or affective perceptions alone.

In another investigation of trust, Iacono and Weisband [25] argued that "action forms" promote trust in virtual groups. These researchers focused specifically on the exchange of messages initiating work processes (asking a specific question or proposing action, implicating a response from others), and messages responding directly to and thereby confirming such initiations, as behaviors that equate to trust. Iacono and Weisband facilitated 14 self-selected virtual teams among students at several universities for three weeks, and coded message archives from these groups for initiations and responses in several categories (getting together, work process, work content, technical aspects, contact regulation, and fun). They also evaluated the quality of the groups' work on papers that the groups collaboratively wrote as a measure of performance. No perceptual measures of trust were involved. Results showed that initiations and responses in both the categories of work content (substantive contributions to the project) and work process (how to work as a group) were significantly associated with the quality of team performance. Additionally, while fun messages were few and not related to quality, the majority of fun messages occurred in high performing teams. Additional analyses revealed that high performing teams formed quickly and handled several activities at once: "If groups focus exclusively or primarily on work process issues, they push the hard work related to work content to the last minute. (In electronic communications, people can send multi-layered messages with a variety of types of interactions (e.g. fun, procedure, contact, technical information), but if they ignore a focus on work content, trust development and performance may suffer" (p. 8). Low performing teams struggled to meet deadlines and worked most intensely immediately prior to deadlines, interacted less

frequently overall, and had members who went absent without explanation.

1.2. Virtual team behavior control, and the rules of virtual groups

Given the theoretical connection between the frequency of specific behaviors and their positive impacts on virtual groups' relational and instrumental processes, then such behaviors, if encouraged or mandated, might contribute to these groups' optimization. The question becomes what specific behaviors can be identified, and whether and how they might be encouraged. According to Piccoli and Ives [26, p. 575], "Previous studies seem to implicitly assume that virtual teams will be self-directed—i.e. that managerial control mechanisms are not required in this setting." Even when virtual groups are specifically instructed about useful practices or rules, but left to their own decision to adopt them or not, such groups tend to ignore these rules until direct interventions and social arrangements draw explicit attention to their rule-following failures [27]. However, the managerial manipulation or incentivization of such behaviors may provide a worthwhile experimental and practical approach to understanding and improving virtual teams, and the deliberate management of virtual teams is a topic that is receiving growing attention [e.g. 28].

In sociological and psychological literatures, the identification of communication rules and norms provides understanding of how groups and relationships work, and how they might be affected by deviations from normative or preferred behaviors [e.g. 29, 30]. Norms and rules may be particularly potent in CMC. According to Lea and Spears [31], CMC offers little apparent information about individual characteristics, making attributions based on the conformity to or deviance from group norms more salient and important. Whereas Mark [32] has argued that implicit norms, or "conventions," are more difficult to appropriate and observe in distributed as opposed to long-term co-located groups, and that explicit conventions invented by groups themselves are violated, her analysis did not examine the deliberate introduction of behavioral rules as a managed or incentivized system. Based on the social information processing theory [5] and the findings reviewed above, a number of coordination rules were devised for empirical testing of their effects on the relational and instrumental dynamics of virtual teams in a system where the rules were explicitly encouraged and in some cases incentivized.

Rule 1: Get started right away. Social information processing theory [5] describes the temporal distortion that CMC incurs because CMC

takes longer for users to achieve satisfactory development and accomplishment over time via their bandwidth-restricted exchanges. Traditionally, groups tend to procrastinate the production phase of their work until half-way through their temporal existence [33]. Delays such as this which may be normal in FtF groups can be much more deleterious in CMC as a group's remaining calendar time may not provide sufficient interaction opportunity considering the retardation of information flow via CMC. This is especially true when using asynchronous CMC, where delays between message exchanges further strain temporal resources. Thus, CMC groups should start early in order to avoid running out of time even more severely than we would see in procrastinating FtF groups. Iacono and Weisband's [25] results also indicate that more successful groups began their work quickly.

Rule 2: Communicate frequently. As with the first rule, social information processing theory [5] indicates the importance that ample messaging portends for group development. The value of communicating frequently is also identified as a critical behavior in Iacono and Weisband's [25] and Jarvenpaa and Leidner's [11] research, where trusting behaviors, or trust perceptions, were associated with frequent exchanges. Communicating frequently also allows the dispersion of activity over time, avoiding the pile-up of activity toward the end of groups' work time periods. The limited nature of electronic and asynchronous communication may otherwise impede adequate rates of information-per-message-per-time exchanges.

Rule 3: Multitask getting organized and doing substantive work simultaneously. This principle is also derived from issues about temporal pace in CMC and the normal sequencing of events in FtF groups. Traditionally, groups first set about organizing, defining, and allocating tasks before members begin executing them. In CMC groups, especially those with limited time, this sequence can be counter-functional for two reasons. First, if approached linearly and sequentially, organizing activities may consume so much time that there is insufficient opportunity for substantive exchange given the pace of CMC. Secondly, the perception that it is undesirable to begin working on collaborative tasks before organizing them is fallacious in many cases. In tasks where duplication of effort might lead to multiple perspectives about the same input information, organizing in order to minimize duplication is not only unnecessary but disadvantageous. Not all tasks are of the magnitude or complexity to benefit from some duplication of effort, but neither is it the case that all tasks must be organized and allocated prior to first steps being

taken. For the most efficient use of time in virtual groups it may be better to begin substantive efforts on group tasks immediately rather than to wait until every aspect has been negotiated. Iacono and Weisband's [25] findings on the simultaneous value of work process and work content exchanges lend credence to this rule.

Rule 4: Overtly acknowledge that you have read one another's messages. In asynchronous CMC it is difficult to tell whether others have read one's postings. Failure to do so may be due to senders' errors (e.g. emailing to an individual rather than the group), system errors (e.g. network, server, or software malfunctions), or receiver behavior (failing to check). Moreover, unless the email software used has an automatic notification option, once a receiver has gotten a message, it requires overt acknowledgement in order for the sender to know. In FtF settings message reception may be more passively inferred through the attention monitoring that co-presence provides [7]. As discussed above, time, channels, and member distribution make it difficult for virtual team members to know if they are experiencing common knowledge, and as Cramton [3] has detailed it is easy to assume that common knowledge is operating in distributed groups when in fact it is not. Explicit acknowledgements should combat this problem. Iacono and Weisband's [25] findings on the value of responses to proposals, not just the proposals themselves, supports this suggestion.

Rule 5: Be explicit about what you are thinking and doing. Social information processing theory [5] holds that CMC can translate into verbal behavior that which is traditionally done nonverbally, and the articulation of feedback messages is one application of this principle. Given that there is no nonverbal backchanneling in CMC, message senders cannot take advantage of partners' nods of assent or head-shaking disagreement in order to know whether proposals have been accepted. Overt response messages are beneficial. Such benefits were seen in Iacono and Weisband's [25] empirical results. Related to the common knowledge problems described above [3], when one does not explicitly state agreement or disagreement with a proposal in a virtual group, other members do not know, but may falsely assume, that the group is in agreement. This can lead to conflict and misdirection about task allocations or decisions. Explicit verbal feedback about suggestions and proposals, while easy to neglect and potentially face-threatening if offered, may allow virtual groups to cohere on decisions and action plans more effectively than when suggestions go unconfirmed or unchallenged.

Rule 6: Set deadlines and stick to them. There are several benefits to this suggestion. Most simply, it is important for work to be on time so that it can be legitimately accepted. More importantly, accomplishing sub-tasks in a timely way reduces the uncertainty that participants may experience in an interaction environment where there is less likely perceived accountability [34]. Social information processing theory [5] recognizes the communication of vulnerability patterns [35] as a means of developing trust in CMC. That is, actors must put themselves in a position in which another partner can provide an outcome which will, even if met, not be greater in benefit to the actor than the potential costs to the actor should the partner fail. If a member could do the job herself but chooses to wait for a partner to do it, there is vulnerability due to the greater costs if the member must share in the failure or do the work herself if the partner reneges. Vulnerability and validation lead to trust over repetitions. In a sense the greatest demonstration of trustworthiness may be the honoring of agreements [12].

In order to test the utility of these rules and the principles on which they are based, the following general hypothesis was generated:

The greater the adherence to each of the rules of virtual groups, the more that virtual team members trust the group, like each other, and perform better work.

2. Methods

In order to ascertain whether any of these rules had impacts if they were managed, i.e. if variation in their adherence could be deliberately manipulated, a quasi-experimental procedure was employed. Such an approach would have great implications for the practical management of virtual groups, a notion deserving applied research attention. However, given the multiplicity of rules and the limited field experiment conditions for their evaluation, a single research study could not manipulate all of the conditions necessary for a purely experimental study of all rules in a setting active enough for their dynamics to accrue. In the following we describe a field experiment design that allowed us to stimulate variance in adherence to various rules, and the methods by which we assessed their effects.

2.1. Participants

Using an inter-university course, groups were composed of members from two major research universities in the northeastern United States. Participants ($N = 44$) were students enrolled in two

senior-level courses focusing on the topic of CMC, with 28 participants from one university and 16 from the other. The courses were electives which did not require particular expertise in technological applications. The students were informed at the courses' inception about the simultaneous instructional and research objectives involved in course participation, for which continuation in the courses implied consent. The courses involved several bi-weekly assignments, and three major group papers of which the first two provided the test-bed for the research design. As the results will show, assignment to experimental conditions harmed no one's grades on these assignments, and actually improved them. Participants were assigned to groups of 3 or 4 members using a randomized/blocking strategy, so that each group had at least one member from a different university, and that four-member groups were evenly distributed. A total of 28 unique groups were formed, 14 for each of the two paper projects.

2.2. Treatments and channels

Groups had 18 days in which to develop the first paper, and 20 days for the second, including two days of extension due to campus weather-related closings and electrical outages. The papers consisted of collaborative research reviews of six primary research articles which were provided to the groups, on the topics of virtual community for the first project and on media selection for the second project. Communication was restricted to the use of asynchronous bulletin-board discussions with file sharing capability, and synchronous chat, both of which were embedded in a course support system. The system recorded all postings and chats for later analysis (the results of which to be reported elsewhere). Participants were admonished not to use e-mail or Instant Messenger: Although such channels are often appealing to group members, previous research [3] has shown how email exchanges often develop among sub-sets of group members, sometimes unknowingly, causing groups to lose common knowledge about ideas. Consistent group conferencing avoids this.

Treatments encouraging rule-related behavior were implemented in the following way. One third of the groups were instructed that they would be evaluated entirely on the quality of their group papers. The other two-thirds of the groups were instructed that 60% of their grades would be determined by the paper quality, and the other 40% would be determined on their adherence to one of two specific rules their groups were assigned. The

second third of groups was assigned to follow rule 2, requiring them to communicate frequently. Groups with this rule were told that each member had to post a message to the group on at least five out of seven consecutive days (and that posting more than one message per day did not release a subsequent daily requirement). A formula was presented by which decrements would be penalized. The final third of groups was required to post at least as many substantive messages as organizing messages (rule 3). Substantive messages discuss the content of the assigned readings or reflect conclusions based on the readings or their synthesis. In contrast, organizing messages suggest or discuss procedures related to allocating, writing, and organizing the work leading up to the completion of the paper. In the first round of papers, this latter rule was implemented as a simple ratio of substantive to organizing comments. This version of the rule did not facilitate frequent early posting of substantive messages to the extent that it had been intended. Organizing messages dominated the early postings, although substantive message postings "caught up" in later exchanges. For the second round of group work, the rule was modified to require that on any day that an organizing message was posted, at least one substantive message must also be posted. Penalty formulas were also articulated for this rule. Finally, it is very important to note that all groups were strongly and repeatedly encouraged to follow *all* the rules whether or not they were graded on adherence.

2.3 Measurement

Dependent variables included several self-administered measures and one observed variable. At the completion of each paper, participants completed a web-administered questionnaire. The first measure included a single-item, five-interval scale measuring the participants' assessment of the quality of their group's paper. Using original measures, participants also rated the degree to which they believed their groups adhered to each of the first six rules (from "not at all" to "completely") with respect to getting started right away, communicating frequently, acknowledging others' messages, being explicit about expectations and progress, multi-tasking content and organizing, and sticking to deadlines. Next, participants completed subscales assessing the relational communication of another member of the group who was a geographically-distributed, virtual partner [20], for immediacy/affection (13 items, Cronbach $\alpha = .93$), task-social orientation (4 items, $\alpha = .67$), and dominance (4 items, $\alpha = .86$).

Participants also evaluated the same partner on liking. Weisband and Atwater's [19] two liking items

appeared to relate to task- or working-related attraction (“how much participants enjoyed working with a particular member,” and “their desire to work with the other member again,” p. 5), similar to the task attraction construct identified by McCroskey and McCain [36]. For comparative purposes, scales from McCroskey and McCain’s multidimensional measure of attraction were employed measuring task attraction and social attraction. Items from all sources were subjected to factor analysis, and the two items from Weisband and Atwater loaded together with task attraction items, while the social attraction items formed a distinct second factor. In subsequent analyses the Weisband and Atwater [19] scales were combined with the task attraction scales for a composite measure. The final measures, with items dropped for low reliability, consisted of 8 items for task attraction ($\alpha = .85$) and 9 items for social attraction ($\alpha = .94$).

Participants repeated these measures for a co-located group partner if they had one, and another virtual partner if they did not. Finally, participants completed scales reflecting the trustworthiness of their group, using the five item scale employed by Jarvenpaa and Leidner [11] who in turn developed it from several related sources. Alpha reliability was .88.

All scales were analyzed at the individual level, since individual scores varied more systematically by conditions than by groups. Although each individual operated in two groups sequentially, repeated measures analyses were not used since individuals worked with different partners and different rules in the first and second tasks, mitigating the comparison within-subjects analysis would otherwise provide.

The quality of the groups’ output was determined by using the average grade from both instructors’ assessments of the group papers (using a 0-100 grading scale). Overall alpha for inter-rater agreement was .75 before any adjustment. On the first assignment three papers’ grades were discrepant between instructors. After the disagreement was articulated and adjusted, final inter-rater reliability achieved .94. On the second round of papers reliability was .88 prior to discussion.

3. Results

3.1. Manipulation check

Although the purpose of the assignment of certain rules to specific groups was not to create a factorial design, but rather, to encourage greater variance in at least rule-following behavior, it was nevertheless worthwhile to see if the rule assignments

indeed affected groups’ rule-following. As a form of manipulation check, therefore, an analysis of variance was conducted to examine the effects of rule assignments on self-reported rule-following, which involved collapsing groups into three categories: those assigned to communicate frequently, those assigned to multi-task organizing and substantive messages, and those with no specific rule assignment.

Consistent with intentions about the rule for communicating frequently, there was a significant difference in the extent to which groups reported frequent messaging, $F(2, 83) = 13.62, p < .001$. Group members assigned to this rule reported a significantly higher mean of rule adherence ($M = 4.17, SD = .99$), according to post hoc Scheffe analysis, than did members of the multitask rule groups ($M = 3.39, SD = 1.15$), which in turn communicated more frequently than groups with no rule ($M = 2.64, SD = 1.11$).

In terms of differences in multi-tasking, a significant difference in self-reported rule-following also obtained, $F(2, 83) = 5.59, p = .005$. Group members assigned to the multitasking rule reported more multitasking ($M = 3.71, SD = .99$) than those with no rule ($M = 2.80, SD = 1.56$), according to the Scheffe test. Those who had the rule to communicate frequently also exhibited a moderate degree of multitasking ($M = 3.23, SD = .97$) and were not different from the multitasking rule condition or the no rule condition.

There were also significant differences in adherence to other rules, according to rule condition assignments: getting started right away, $F(2, 83) = 3.79, p = .027$; acknowledging others, $F(2, 83) = 5.73, p = .005$; and explicitness, $F(2, 83) = 4.95, p = .009$. No effect obtained on self reports of sticking to deadlines, $F(2, 83) = 2.47, p = .091$. For five of the six rules tested, however, there did seem to be a good degree of variance in rule-following behavior, at least to the extent reported by the participants themselves, which had been the purpose of the rule assignment manipulation.

3.2. Hypothesis tests

The next analyses examined the general hypothesis about the impacts of rules, by computing correlations between the degree to which participants reported that their groups followed each rule and the various outcomes to which they were predicted to relate. The most striking findings were the relatively strong and consistent correlations between the degree to which participants reported following each rule and the level of *trust* that they experienced, with each 1-tailed correlation $p < .001$: getting started right

away, $r(86) = .43$; communicating frequently, $r = .65$; acknowledging others, $r = .57$; being explicit, $r = .67$; multitasking, $r = .45$; and sticking to deadlines, $r = .65$.

Rule following was also associated with *task attraction*, $p < .001$ in each case: getting started right away, $r = .41$; communicating frequently, $r = .53$; acknowledging others, $r = .53$; being explicit, $r = .60$; multitasking, $r = .41$; and sticking to deadlines, $r = .60$. *Social attraction* was also predicted by the extent each rule was followed, $p < .021$ or lower: getting started right away, $r = .22$; communicating frequently, $r = .45$; acknowledging others, $r = .37$; being explicit, $r = .40$; multitasking, $r = .29$; and sticking to deadlines, $r = .43$.

Additionally, following each rule corresponded with *how well the participants thought they had done* on their collaborative tasks, with $p < .025$ for each rule's correlation with self-rated success: getting started right away, $r = .21$; communicating frequently, $r = .37$; acknowledging others, $r = .38$; being explicit, $r = .49$; multitasking, $r = .41$; and sticking to deadlines, $r = .42$.

Interestingly, the objective quality of the participants' end results, their collaborative papers, was not correlated with each and every reported level of rule-following. Most rules, again, did relate to this outcome, but with a somewhat lower magnitude than they did with participants' perceptions. In the case of the instructors' average assessment of the *quality of groups' papers*, multi-tasking did not appear to help groups perform better, $r = .12$, $p = .16$. The other rules did appear to enhance the objectively-rated quality of teams' work, $p \leq .025$: getting started right away, $r = .21$; communicating frequently, $r = .41$; acknowledging others, $r = .28$; being explicit, $r = .29$; and sticking to deadlines, $r = .31$.

In order to assess which of the rules were most influential in terms of each of these outcomes, multiple regression analyses were conducted. The level of *trust* in groups was predicted most strongly by three rule-following variables, with a total adjusted R^2 of $.55$, $F(3, 82) = 35.02$, $p < .001$: being explicit ($b = .62$), sticking to deadlines ($b = .30$), and communicating frequently ($b = .23$). *Task attraction* was influenced most by sticking to deadlines ($b = .37$) and being explicit ($b = .35$), adjusted $R^2 = .42$, $F(2, 83) = 31.50$, $p < .001$, whereas *social attraction* was predicted by communicating frequently ($b = .23$) and sticking to deadlines ($b = .19$), $R^2 = .22$, $F(2, 83) = 12.86$, $p < .001$. Although the *self-assessed quality of the groups' work* was predicted most strongly by explicitness, adj. $R^2 = .23$, $F(1, 84) = 26.50$, $p < .001$, the *objective assessment of the groups' work quality* was affected most strongly by

adherence to the rule for frequent communication, adj. $R^2 = .16$, $F(1, 84) = 16.68$, $p < .001$.

The research question about the relative impacts of socially-oriented and task-oriented messaging was assessed by examining the relationships of participants' assessments of partners' affectionate communication and task-oriented communication on the liking, trust, and performance quality measures. Consistent with the findings of Weisband and Atwater's [19] correlations between observed task messages and work-related liking, participants' assessments of partners' task oriented communication was strongly associated with task attraction, $r(86) = .57$, $p < .001$, 2-tailed. However, the correlation between affectionate communication ratings and task attraction was greater, $r = .82$, $p < .001$. Social attraction was associated with affectionate communication, $r = .82$, $p < .001$, and with task-oriented communication to a lesser extent, $r = .23$, $p < .03$. Trust, too, was associated with affection, $r = .66$, $p < .001$, and task-oriented communication, $r = .37$, $p < .001$. Groups experiencing more affectionate communication also performed better on their work, both according to their own performance assessments, $r = .57$, $p < .001$, and the instructors', $r = .47$, $p < .001$.

4. Discussion

The present study examined the degree to which the potential problems of virtual teams could be ameliorated by specific behavioral guidance, associated with several rules for virtual teams. Virtual groups sometimes do overcome geographic dispersion and channel constraints, and/or they possibly could do so when we recognize different behavioral bases for judgments important to group work, and foster them. This study attempted examine some of these dynamics through assignments that led to variations in key behaviors, and assessing the impacts of those behaviors on perceived and objective evaluations of virtual groups' work. Results indicated that there are several viable behavioral routines available to virtual groups and that the more these behavioral routines are adopted, the better the experience and the better the results of virtual teams efforts.

The results of this study supported the effectiveness of each of the six hypothetical behavioral rules, and did so surprisingly strongly. Indeed, the consistent and high correlations between self-reports of the groups' adherence to rules, and perceived trust, task attraction, social attraction, and perceived quality of work were somewhat remarkable. Further, it appears that the perceptual

states corresponded relatively well with an objective assessment of the quality of groups' work. When it came to the instructors' outside evaluation of the groups' projects, almost every one of the rule-following reports correlated with paper quality also, with *multitasking substantive/organizing messages* being the only rule that failed to predict actual grade.

Two possible explanations for the results as a set are available. One is that, as hypothesized, a parsimonious and powerful set of rules has been identified through this research which affects the continuum of behavior, perception, and outcomes. A more skeptical but no less important interpretation may be that the efforts of the present and previous research to identify specific rules or best practices that facilitate virtual groups are misguided. It may be that the mere following of *any* rules reduces uncertainty and leads to trust and liking in virtual groups. There will be two ways to assess this rather grand but compelling contention. One will be to assess the actual behaviors associated with rule following, with perceptions, and with performance assessment variables. If behaviors that should logically align with rules do in fact correspond with self-reports, we can be more confident that perceptions mapped on to what participants actually did. Even if so, such analyses will not untangle the possibility that following any behavioral regimen might not have been just as effective.

On the other hand, if these rules are not a placebo, they may be a panacea. Perhaps these rules are beneficial not only to virtual groups, but to groups in general. There is little in the rules themselves that does not look like good advice for any or all groups, virtual or not. Trust issues in groups are nothing new, and as one experiment has found, more delicate and problematic in comparable FtF than virtual teams [34]. At the same time, the notion that virtual partners know little else about one another besides their online behavior suggests that behavioral rules may have special potency in the electronic environment. Compliance to or deviation from rules may have stronger impacts online than offline. Such dynamics would be consistent with previous research in which attraction was rationally based online but irrationally offline [19], and in other research where attributions are more extreme in CMC than in FtF conditions [see for review 9].

5. References

[1] J. L. King and R. L. Frost, "Managing distance over time: The evolution of technologies of dis/ambiguation," in *Distributed Work: New Research on Working Across Distance Using Technology*, P. Hinds and S. Kiesler, Eds. Cambridge, MA: MIT Press, 2002, pp. 3-26.

[2] M. O'Leary, W. Orlikowski, and J. Yates, (2002). "Distributed work over the centuries: Trust and control in the Hudson's Bay Company, 1670-1826," in *Distributed Work: New Research on Working Across Distance Using Technology*, P. Hinds and S. Kiesler, Eds. Cambridge, MA: MIT Press, 2002, pp. 27-54.

[3] C. D. Cramton, (2001). "The mutual knowledge problem and its consequences for dispersed collaboration," *Organization Science*, vol. 12, pp. 346-371, 2001.

[4] S. L. Jarvenpaa, K. Knoll, and D. Leidner, "Is anybody out there?: The implications of trust in global virtual teams," *Journal of Management Information Systems*, vol. 14, pp. 29-64, 1998.

[5] J. B. Walther, "Interpersonal effects in computer-mediated interaction: A relational perspective," *Communication Research*, vol. 19, pp. 52-90, 1992.

[6] Hinds, P. J., and S. Kiesler, Eds., *Distributed Work: New Research on Working Across Distance Using Technology*. Cambridge: MIT Press, 2002.

[7] B. Nardi and S. Whittaker, "The place of face to face communication in distributed work," in *Distributed Work: New Research on Working Across Distance Using Technology*, P. Hinds and S. Kiesler, Eds. Cambridge, MA: MIT Press, 2002, pp. 83-110.

[8] J. Galagher and R. E. Kraut, "Computer-mediated communication for intellectual teamwork: An experiment in group writing," *Information Systems Research*, vol. 5, pp. 110-138, 1994.

[9] J. B. Walther and M. R. Parks, (2002). "Cues filtered out, cues filtered in: Computer-mediated communication and relationships," in *Handbook of Interpersonal Communication*, 3rd ed., M. L. Knapp and J. A. Daly, Eds. Thousand Oaks, CA: Sage, 2002, pp. 529-563.

[10] C. Handy, "Trust and the virtual organization," *Harvard Business Review*, vol. 73, pp. 40-50, 1995.

[11] S. L. Jarvenpaa and D. E. Leidner, D. E. (1998). "Communication and trust in global virtual teams," *Journal of Computer-Mediated Communication* [Online]. 3 (4). Available: <http://www.ascusc.org/jcmc/vol3/issue4/jarvenpaa.html>

[12] J. Feng, J. Lazar, and J. Preece, "Interpersonal trust and empathy online: A fragile relationship," in *Proc. SIGCHI*, 2003, pp. 718-719.

[13] W. F. Cascio, "Managing a virtual workplace," *Academy of Management Executive*, vol. 14, pp. 81-90, 2000.

[14] M. C. Greene, "Development of trust in on-line social relationships," presented at the Conference on Computer-Supported Social Interaction, Oxford, OH, April 2002.

[15] N. Bos, J. Olson, D. Gergle, G. Olson, and Z. Wright (2002, April). "Effects of four computer-mediated communications channels on trust development," in *Proc. SIGCHI*, 2002, pp. 135-140.

- [16] E. Rocco, (1998). "Trust breaks down in electronic contexts but can be repaired by some initial face-to-face contact," in *Proc. SIGCHI*, 1998, pp. 496-502.
- [17] J. Y. Smith and M. T. Vanacek, "Dispersed group decision making using nonsimultaneous computer conferencing: A report of research," *Journal of Management Information Systems*, vol. 7, pp. 71-92, 1990.
- [18] P. L. McLeod, "An assessment of the experimental literature on electronic support of group work: Results of a meta-analysis," *Human-Computer Interaction*, vol. 7, pp. 257-280, 1992.
- [19] S. Weisband and L. Atwater, "Evaluating self and others in electronic and face-to-face groups," *Journal of Applied Psychology*, vol. 84, 632-639, 1999.
- [20] J. B. Walther and J. K. Burgoon, "Relational communication in computer-mediated interaction," *Human Communication Research*, vol. 19, pp. 50-88, 1992.
- [21] J. B. Walther, C. Slovacek, and L. C. Tidwell, "Is a picture worth a thousand words? Photographic images in long term and short term virtual teams," *Communication Research*, vol. 28, pp. 105-134, 2001.
- [22] L. C. Abrams, R. Cross, E. Lesser, and D. Z. Levin, "Nurturing interpersonal trust in knowledge-sharing networks," *Academy of Management Executive*, vol. 17, pp. 64-77, 2003.
- [23] J. M. Wilson, S. G. Straus, and W. J. McEvily, "The development of trust in distributed groups over time," presented at the Academy of Management conference, Toronto, Canada, 2000.
- [24] D. Meyerson, K. E. Weick, and R. M. Kramer, "Swift trust and temporary groups," in *Trust in Organizations*, R. M. Kramer and T. R. Tyler, Eds. Thousand Oaks, CA: Sage, 1996, pp. 166-195.
- [25] C. S. Iacono and S. Weisband, "Developing trust in virtual teams," presented at the 30th Hawaii International Conference on System Sciences, Maui, HI, Jan. 1997.
- [26] G. Piccoli and B. Ives, (2000). "Virtual teams: Managerial behavior control's impact on team effectiveness," *Proc. ICIS*, 2000, pp. 575-580.
- [27] J. B. Walther, M. Boos, and K. J. Jonas. (2002, Jan.). Misattribution and attributional redirection in distributed virtual groups. *Proc. HICSS 35* [Online]. Available http://www.hicss.hawaii.edu/HICSS_35/HICSSpapers/PDFdocuments/OSVWE02.pdf
- [28] B. L. Kirkman, B. Rosen, C. B. Gibson, P. E. Tesluk, and S. O. McPherson, "Five challenges to virtual team success: Lessons from Sabre, Inc.," *Academy of Management Executive*, vol. 16, pp. 67-79, 2002.
- [29] M. Argyle and M. Henderson, "The rules of relationships," in *Understanding Personal Relationships: An Interdisciplinary Approach*, S. Duck and D. Perlman, Eds. London: Sage, 1985, pp. 63-84.
- [30] S. B. Shimanoff, (1988). "Group interaction via communication rules," in *Small Group Communication: A Reader*, 5th ed., R. S. Cathcart and L. A. Samovar, Eds. Dubuque, IA: Wm. C. Brown, 1988, pp. 50-64.
- [31] M. Lea and R. Spears, "Paralanguage and social perception in computer-mediated communication," *Journal of Organizational Computing*, vol. 2, pp. 321-341, 1992.
- [32] G. Mark, "Conventions for coordinating electronic distributed work: A longitudinal study of groupware use," in *Distributed Work: New Research on Working Across Distance Using Technology*, P. Hinds and S. Kiesler, Eds. Cambridge, MA: MIT Press, 2002, pp. 259-282.
- [33] C. J. G. Gersick, "Time and transition in work teams: Toward a new model of group development," *Academy of Management Journal*, vol. 31, pp. 9-41, 1988.
- [34] D. S. Staples and P. Ratnasingham, "Trust: The panacea of virtual management?" in *Proc. ICIS*, 1998, pp. 128-144.
- [35] F. E. Millar and L. E. Rogers, (1976). "A relational approach to interpersonal communication," in *Explorations in Interpersonal Communication*, G. R. Miller, Ed. Beverly Hills, CA: Sage, 1976, pp. 87-104.
- [36] J. C. McCroskey and T. A. McCain, "The measurement of interpersonal attraction," *Speech Monographs*, vol. 41, pp. 261-266, 1974.