Effects of Team Size on Participation, Awareness, and Technology Choice in Geographically Distributed Teams

Erin Bradner and Gloria Mark
Dept. of Information and Computer Science
University of California, Irvine
Irvine, CA92697-3425, USA
+1 949-824-5955
{ebradner; gmark}@ics.uci.edu

Tammie D. Hertel
Intel Corporation
5000 W. Chandler Blvd. M/S: CH7-317
Chandler, AZ 85226
+1 408-552-2873
tammie.d.hertel@intel.com

Abstract

In this paper we investigate the effects that team size has on geographically distributed teams within a large, multi-national manufacturing organization. Survey responses from 109 members of distributed teams indicate that compared to members of larger teams, members of smaller teams participated more actively on their team, were more committed to their team, were more aware of the goals of the team, were better acquainted with other team members' personalities, work roles and communication styles, and reported higher levels of rapport. The data also show that larger teams are more conscientious in preparing meeting agendas compared to smaller teams. Consistent with their emphasis on coordination, larger teams adopted technology to support the coordination of asynchronous work, while smaller teams adopted collaboration technology. Implications for technology adoption are discussed.

1. Introduction

A debatable, but commonly held assumption about teams is that they outperform individuals, especially when performance requires multiple skills, judgments and experience [14]. The trend towards reengineering organizations around teams [11] has occurred in parallel with the proliferation of computer-mediated communication technology, rise in telecommuting, and increased reliance on information technology in organizations. In many global corporations, employees are developing new sets of skills in order to compete in today's global marketplace. Drawing on experience and training from working on colocated teams, people are adapting teaming behaviors to apply to geographically distributed teamwork. This paper examines this relatively new breed of teams – distributed teams. Distributed teams are defined as *work teams using technology to communicate with one or more geographically remote members* [2]. Distributed teams are sometimes referred to as *virtual* teams. This term was originally used to describe teams that conduct meetings in multi-dimensional electronic meeting spaces but has evolved to apply to geographically distributed teams using a gamut of collaboration technologies including teleconferencing [c.f. 7, 8, 10, 12, 17]. Communication in "virtual teaming may be as elaborated as a 3-D rendered electronic environment or as mundane as a conference call" [2]. Thus the term *virtual* simply connotes 'virtual colocation' [16]. We prefer the term 'geographically distributed team,' and use it here because we believe it more precisely describes the teams we studied though the two terms are interchangeable.

Members of distributed teams operate in an organizational context, assume differentiated roles, are interdependent, and produce some intellectual or physical product for which members have collective responsibility. The term *distributed team* connotes technology-mediated communication which *may or may not* involve communication and data-sharing with a computer.

The teaming trend and 'wiring of the workplace' have laid the organizational and technological groundwork for distributed teams. Findings from a survey of teams in U.S. companies indicate that 66% had at least one member who was permanently assigned to a location geographically distant from the rest of the team [15]. Among these distributed teams, 31% of the members were not colocated with the others on their team. Recent academic studies of distributed teaming at Boeing Corporation [18], [16] and management texts [8] have identified some features of distributed teams that may distinguish them from colocated work teams. Factors that could be considered unique to distributed teams are the coordination problems caused by transfer of physical deliverables, the fact that membership on such teams often spans organizational boundaries, and the empirical evidence that a single employee will have occasion to participate on multiple teams, when teams become

Proceedings of the 36th Hawaii International Conference on System Sciences (HICSS'03)
0-7695-1874-5/03 $17.00 © 2002 IEEE

geographically distributed. Furthermore, distributed teams have been studied from the perspective of various social variables including trust [12], [10], identity [23], leadership [3],[17] and culture [9] [5].

1.1 Size of distributed teams

One variable that has received surprisingly little attention in the study of distributed teams is that of team size. This is especially surprising as the fields of social psychology and organizational behavior have had a long interest (mostly in the 1950's and earlier) in studying how group size affects participation and process. Larger groups provide obvious advantages of having more diverse expertise, skills, and problem-solving approaches. On the other hand, large groups entail more coordination costs than smaller groups. Combining work, arranging schedules, and remembering each member's particular expertise become more difficult as team size increases. Large team size has been linked to lower participation in group activities [7], [6]. As the size increases, the disparity between who participates and who does not increases dramatically [1]. This data was interpreted by Shaw [19] to reveal that in large groups, group structure becomes more well-defined with increase in size, for example in adopting different roles, particularly that of leader. In addition to level of participation, group size has been associated with other effects. Larger size leads to more conformity to group norms [19], less motivation to perform [21] and lower satisfaction, as measured along a variety of dimensions (e.g. [13]; [20]; [4]).

It is not uncommon for distributed teams to consist of large numbers of members. Electronic communication and application-sharing technologies can easily connect people across distance for synchronous collaboration. Data sharing technologies and email can enable teams to conduct asynchronous work. Mark et al. [16] report how one large distributed team in a global company invited anyone to join in on their distributed team meetings irrespective of geographical location. Thus, although many barriers still exist for adopting technology across distance (e.g. hardware incompatibility or lack of infrastructure) the technology exists to connect team members from nearly any geographic location. The flexibility exists to create project teams to accomplish a given task, and barring personnel cost, team size should not be a limitation. One limitation that seems fairly obvious is that distributed teams have more coordination costs than physically colocated teams, however it is not clear which of the size effects from studies of physically colocated teams would transfer to distributed teams.

In a practical sense, the more group members there are, the less opportunity each member has to participate in a discussion. This is true of face-to-face teams as well as distributed teams. In face-to-face teams, members who have lower status in the organization tend to participate less [14]. In a distributed team, the question arises: who is less likely to participate?

There has been some discussion on the *main site advantage* in distributed teams, i.e. those members located at the main company site participate more in the team whereas those members located in remote sites feel less "connected" to the team [16], [23]. Furthermore, nonparticipation and poor performance are more visible in smaller groups [22]. We would expect similar effects in distributed teams, especially during synchronous work. When a distributed team is small, we would expect that other members are more aware of the effort of each individual. There should be less "free riding" as would occur in a larger team where behavior is less visible. The increased visibility in small teams should affect participation.

1.2 Hypotheses

The purpose of this study is to investigate the effect that team size has on distributed teams. We developed the following hypotheses:

H1: Team size should affect the level of participation in a distributed team. Members of smaller distributed teams should participate more in the team than members of larger distributed teams.

Previous research on participation in physically colocated teams shows that that smaller size teams have higher participation of the members. Though distributed teams differ from colocated teams in that telephone and/or computer-mediated communication is used, we would still expect to see effects of size on participation. The behavior of team members in smaller teams should be more visible than in larger teams. Because nonperformance is also more visible, we expect that participation in small teams would be higher in a greater proportion of the team's members.

H_2: Team size should affect the knowledge that teammates have about other members. Members of smaller distributed teams should have more knowledge about others' work roles, expertise and communication styles.

As a consequence of participating more in the team, members of smaller distributed teams should have more awareness about other team members. In particular, we expect that in smaller teams, people are more likely to learn the work roles and expertise of other members. Because smaller teams would have chances for more

intimate communication (due to more participation) we expect that members would learn when others are available for communication and how willing they were to communicate. We expect that large team size would diminish these types of awareness.

H_3: Team size should affect the level of rapport among the team members. Members of smaller distributed teams should have greater rapport than members of larger distributed teams.

As a consequence of participating more in the group, we expect that members of smaller distributed teams will have developed better rapport. We define rapport as enjoyment in interacting and working together with other team members. A team with high rapport would have members who like and respect each other. We expect that in smaller teams there would be more informal interaction enabling rapport to be developed. In larger distributed teams, interaction should be more formal, or more unequally weighted toward the team leader, hindering the development of rapport.

H_4: Team size should affect commitment of the members. Members of smaller distributed teams should have greater commitment to the team than members of larger distributed teams.

Small teams who are physically colocated have been shown to have higher cohesion than larger teams [13]. We expect that in small, distributed teams – where people know and like other team members – higher levels of cohesion would develop. As a result, members of smaller distributed teams should have higher commitment to the team compared to members of larger distributed teams.

H_5: Team size should affect the knowledge of team goals. Members of smaller distributed teams should have a clearer understanding of the team goals than members of larger distributed teams.

We expect that in smaller teams, people would have more of a chance to discuss team goals, and evaluate whether the teams' actions are consistent with their goals. In a larger distributed team, we expect the participation to be more dominated by the team leader, and members may have less of a chance to question whether actions are consistent with the goals.

H_6: Team size should affect the procedures in the team. Larger distributed teams should have better-defined procedures and should maintain them better than smaller distributed teams.

Because larger teams require more coordination, we expect that larger teams will have developed better-defined team structures and procedures, concerning aspects such as the team agenda and minutes.

H_7: Team size should affect the choices for technology to support the distributed team. Larger distributed teams should choose technologies that support coordination and team logistics, whereas smaller teams should choose technologies that support communication and collaboration.

As larger teams require more coordination than smaller teams, we expect that larger teams will be more likely to adopt technologies that support team coordination and logistics. As smaller teams require less coordination, we expect that their technology choice for the team would rather support communication and collaboration. We do not believe that large teams would use coordination technology to the exclusion of all other technologies, but rather that the adoption patterns of large teams would differ from small teams with regard to satisfying a more pressing need for coordination.

1.3 Research setting

In winter of 2000, a management group at a large multinational corporation named Simcon (a pseudonym) met to discuss productivity issues at what was called the Productivity Summit. All business groups that had a vested interest or had something to contribute were invited to attend. Through brainstorming and discussion, the outcome of this session identified that the corporation was wasting a lot of time and money due to meeting ineffectiveness. As the issue was further scrutinized, it became clearer that very specific problems could be linked to distributed team meetings. Simcon is a highly dispersed corporation that almost exclusively leverages meetings to bring teams together to get work done. Simcon also has a philosophy of hiring the best person for the job, regardless of geographic location. With tremendous, rapid growth, this quickly presented challenges as employees struggled to work together across time zones, distance, or other cultural barriers.

Old norms provided the flexibility of frequent travel to meet face to face. Because of this, employees did not have to invest time in learning new skills required in distributed team situations. However, as travel budgets became limited, teams struggled even more to accomplish tasks and meet deliverables. It was determined that being ineffective in distributed teams was a much more critical issue than in the past. The corporation no longer had the ability to compensate for the lack of skills by traveling to meet face-to-face. Thus, the productivity summit met and decided that teams had

to get better at working together – while apart. Based on this realization, the *Working Closer* team was formed.

1.4 The Working Closer Team

The *Working Closer Team* was named appropriately, signifying the desire to have teams function as though they were physically located together. The Working Closer Team agreed that Simcon's distributed teams were less effective than its co-located teams. Once the problem had been identified, the team set out to find the root cause(s) of the problem. The Working Closer team, with the assistance of researchers at UC Irvine, authored a survey instrument to probe into the effectiveness of Simcon's distributed teams. The corporation leveraged electronic and collaborative capabilities to help gather information and recruit teams to complete the survey from across the organization and globe, to participate. The working closer team administered the survey during the winter of 2001.

2. Methodology

This study is part of a larger study of distributed team performance. Eighteen teams were identified in the organization that met the criteria of having well defined team membership, and being willing to participate in the study. A web link to a 72-question survey was emailed to 204 members of 18 different teams across Simcon. The tasks the teams were engaged in were diverse. All participants were assured that strict anonymity and confidentiality would be maintained. Codes were used instead of names.

Team Size	Number of respondents
Smaller teams	
4	4
6	7
7	11
9	17
Total Smaller	**39**
Larger teams	
14	7
15	12
17	15
18	36
Total Larger	**70**

Table 1. Number of respondents according to team size.

There was no systematic relationship of task type to small or large teams. Examples of teams and their tasks were a project team designed to develop relocation policies, a taskforce established to standardized hazardous waste removal practices across manufacturing sites, and a knowledge management team established to share 'lessons learned' associated with the troubleshooting production technology at different manufacturing sites.

The overall response rate was (89%). The teams ranged in size from 4 members to 18 members. The response rate for individual teams ranged from 28% to 100%. Team members were initially asked a set of background questions such as: *How long have you been at Simcon? What is your job title?* The rest of the survey used a 7-point Likert scale (1 = strongly disagree and 7 = strongly agree) for questions such as: *I know the goals of the team* and *A clear agenda is published at least 24 hours prior to team meetings*. Teams selected for our study had similar relative levels of geographic dispersion i.e. the proportion of members who were located in different countries was similar across all teams. A *post hoc* analysis on responses received proved this to be true (an ANOVA on geographic dispersion showed no effect for size).

In order to test our hypotheses of smaller versus larger teams, in our analysis we included only those responses from people who were members of teams of nine people or less, and responses of people from teams of 14 people or more. Thus, we considered teams with nine or fewer members to constitute a "smaller" team, and teams with fourteen or more members to constitute a "larger" team. The smaller team sizes ranged from a team size of four to nine people. The larger team sizes ranged from 14-18 people. After coding the data to reflect this criteria for small and large teams, there were a total of 39 responses from people of smaller teams and 70 responses from people of larger teams for a total of 109 responses. Table 1 shows the shows the breakdown of the responses according to team size.

3. Results

In this section, we will address each of our hypotheses based on our survey findings. As this study is part of a larger study, we report only those survey questions that address our hypotheses. Other questions in the survey that are not discussed here addressed topics of logistics and specific meeting norms.

Our first hypothesis addressed the relationship between participation and team size (H_1: *Team size should affect the level of participation in a distributed team).* Three questions shown in Table 2 specifically

addressed H_1. A MANOVA shows that responses from all three questions indicate that members of smaller teams, compared to larger teams, participate significantly more in team meetings.

Participation	Smaller Team	Larger Team	F-value N=109
I am encouraged by my team-lead/facilitator to interact often with my team members between meetings (for example via telephone calls, e-mail, face-to-face, etc.)	5.63(1.17)	5.10(1.38)	F(3,91)=7.72, p<.001
How often do you normally participate actively in the team meetings (by asking questions, presenting ideas, etc.)	4.71(1.01)	3.86(1.19)	
How often do you normally participate between meetings (using collaboration tools)	3.85(1.15)	3.16(1.21)	

Table 2. Means and standard deviations in parenthesis for questions addressing participation.

The mean response from members of smaller teams to the question: *How often do you normally participate actively in team meetings (by asking questions, presenting ideas, etc.)* is higher than from members of larger teams. Interestingly, the members of smaller teams reported that they were encouraged significantly more by their team leader or meeting facilitator to interact with their team members between meetings compared to members of large teams. This encouragement appears to result in more interaction, since the response to the question: *How often do you normally participate between meetings (using collaboration tools)* is higher for smaller teams.

Thus, smaller teams apparently are encouraged to participate and are responding to that encouragement by interacting with their team members via collaboration technology more often than are members of larger teams. Our data support our hypothesis.

Our second hypothesis stated that members of smaller distributed teams should be better acquainted with their teammates and have more awareness about their work roles, expertise, and willingness to communicate with others on the team (*H_2: Team size should affect the knowledge that teammates have about other members.*) Compared to small teams, we proposed that large team size would provide less opportunity to cultivate these types of awareness. We considered four of our survey questions to address the amount of awareness that team members have of others on their team (Table 3). A MANOVA performed on these questions showed a significant difference in favor of smaller teams. Members of small teams claimed they knew others on their team better on a personal basis, were better acquainted with their work roles and expertise, and knew more about the means by which they could communicate with their teammates, compared to larger teams. Thus, our data support this second hypothesis.

Awareness	Smaller Team	Larger Team	F-value N=109
I am acquainted with the other members of my team (I know other members on a personal basis, I understand their working styles and cultures).	5.05 (1.65)	4.33(1.58)	F(4,101)=2.66, p<.04
I'm acquainted with their work roles	5.74(1.20)	5.14(1.39)	
I'm acquainted with other members' areas of expertise	5.33(1.30)	4.87(1.38)	
I'm acquainted with how willing they are to communicate (either face-to-face, via the telephone, etc.)	6.03(1.14)	5.31(1.20)	

Table 3. Means for questions addressing awareness of other team members.

Our third hypothesis stated that smaller distributed teams will developed better rapport compared to larger teams: *H_3: Team size should affect the rapport among the team members.* Smaller distributed teams should have greater rapport than larger distributed teams. Six of the survey questions addressed rapport (see Table 4). A MANOVA shows that responses to these questions generally support this hypothesis, reaching a significance level of .06. Smaller teams have higher levels of rapport.

Compared to those on larger teams, people from smaller teams reported that they enjoy interacting more with their team members, feel more strongly that they are working as a team, are communicating more openly and with trust, are maintaining an environment of truth, and that their team spent sufficient time in the initial meetings to develop rapport. Consistent with this, smaller teams agreed more strongly than larger teams that there currently exists good team rapport. Thus, our data support our third hypothesis.

Our fourth hypothesis stated that as a result of knowing more about the other team members, members work to their team, and keeping commitments to their team. Smaller teams also reported higher levels of satisfaction associated with working on their team, compared to members of larger teams. Larger teams reported that they multi-task more during meetings, which is an indication that they are not engaged with the team during meetings. Thus, our data support our fourth hypothesis.

Rapport	**Smaller Team**	**Larger Team**	**F-value N=109**
I enjoy interacting with my team members	6.23(0.81)	5.60(1.10)	F(6,76)=2.13, p<.06
I feel like we are working together as a team.	5.64(1.20)	5.19(1.32)	
I communicate openly and with trust to others on my team.	6.31(0.83)	5.94(0.94)	
My team maintains an environment of truth, working to avoid dishonesty and covertness	6.11(0.83)	5.83(0.92)	
I feel that sufficient time was dedicated in the first few meetings to build team rapport (good interaction between team members).	5.09(1.71)	4.44(1.27)	
I feel that there currently exists good team rapport (good interaction between team members)	6.10(0.94)	5.37(1.56)	

Table 4. Means and standard deviations in parenthesis for questions addressing team rapport.

Our fifth hypothesis stated: *H_5: Team size should affect the knowledge of team goals.* We proposed that members of smaller distributed teams should have better knowledge of the goals of their team. Three of our survey questions addressed team goals (Table 6). A MANOVA showed that members of smaller teams were significantly more aware of the goals of their team compared to members of larger teams. The former reported that they were more likely to know the goals of their team, that their team goals were more clearly defined, and that they were more likely to take responsibility for enforcing the

Commitment	**Smaller Team**	**Larger Team**	**F-value N=109**
More often than not, I complete my work on time.	6.26(0.80)	5.66(1.15)	F(6,85)=2.66, p<.02
I contribute my best work to the projects I work on with this team.	5.95(1.11)	5.36(1.54)	
Working on this team is a satisfying experience.	5.87(0.93)	5.14(1.42)	
I wish I could focus my efforts elsewhere than on the responsibilities I have in association with this team.	3.26(1.60)	3.28(1.62)	
I make a point to keep my commitments to the team and its members.	6.31(0.73)	5.79(0.84)	
How much of your time during the meetings do you multi-task (for example, read e-mail, surf the web, talk with other people, etc.)	2.33(0.93)	3.00(1.23)	

Table 5. Means for questions addressing commitment of the team members.

of smaller distributed teams should have higher levels of commitment to the team (*H_4: Team size should affect the commitment of the members*). Six questions in our survey addressed this hypothesis (see Table 5). The results of the MANOVA indicate that significantly higher levels of commitment exist among small teams compared to larger teams. Members of smaller teams reported more often completing their work on time, contributing their best

agreed processes, goals and ground rules. The data clearly support our fifth hypothesis.

Goals	Smaller Team	Larger Team	F-value N=109
I know the goals of the team	6.51 (0.14)	6.03(0.11)	F(3,104)=3.54,p< .02
Team goals were clearly defined	6.13(0.86)	5.79(1.09)	
The team members take responsibility for enforcing the agreed processes, goals and ground rules	5.53(1.22)	4.90(1.22)	

Table 6. Means and standard deviations in parenthesis for questions addressing goals of the team.

Because larger teams require more coordination, our sixth hypothesis stated that larger teams will have developed better defined procedures concerning aspects such as the team agenda and minutes (H_6). Three questions addressed team procedures, focusing on the agenda and minutes (Table 7). A MANOVA shows that for larger teams, it was significantly more likely that a clear meeting agenda is published prior, and in advance of meetings, and that the agenda is sufficiently detailed. Again, our hypothesis is supported.

Our seventh hypothesis was: *team size should affect the choices for technology to support the distributed team.* We asked each respondent to report how frequently they used technology to interact with their teammates *between* meetings (Table 8). A MANOVA shows that there is a significant difference between responses of smaller and larger team members. Simcon provided a variety of collaboration technologies to its teams yet did not mandate its use. Our data indicate that team members availed themselves of different technology depending on the size of the team to which they belonged. Larger teams were more likely to adopt technology that supports team coordination and logistics, compared to smaller teams. The data show that large teams used Simcon's web-based meeting facilitation technology more than small teams. The meeting facilitation technology stored a meeting calendar for the team, displayed agendas and provided a central repository for meeting minutes. The coordinating features of this technology appeared to be a better match to the needs of larger teams than smaller teams.

Procedures	Smaller Team	Larger Team	F-value N=109
Is a clear agenda published at least 24 hours prior to the meeting?	4.29(1.25)	4.94(1.01)	F(3,97)=3.02, p<.03
Are minutes published within 24 hours of the meeting?	3.81(1.41)	4.06(1.11)	
The agenda is sufficiently detailed.	4.32(1.25)	4.71(0.95)	

Table 7. Means and standard deviations in parenthesis for questions addressing procedures.

Small teams, on the other hand, were less likely to adopt meeting facilitation software but were more likely to adopt technology that supported collaboration such as application sharing (NetMeeting™) and information spaces (eRoom™). We argue that smaller teams reported higher levels of adoption of technology such as application sharing technology and information spaces due to the fact that they had less pressing coordination issues than larger teams.

4. Discussion and implications

Our data provide evidence to support each of our hypotheses. Compared to members of larger teams, we found that members of smaller teams participated more actively on the team, were more aware of the goals of the team, were better acquainted with other team members' personalities, work roles and willingness to communicate and reported higher levels of rapport. We also found that members of larger teams reported that their teams were more conscientious in coordinating activities such as preparing meeting agendas compared to responses from smaller teams.

Our results lead us to consider reasons why our hypothesis concerning team size and technology choice (Hypothesis 7) was confirmed. We found that larger teams adopted technology to support coordination of asynchronous work while smaller teams adopted collaboration technology. We now speculate that since larger teams maintain their formal procedures better than smaller teams (at least for agendas), they pay more attention to their coordination processes. We hypothesize that this attention to coordinating activities in the larger teams influences them to adopt technology designed to facilitate coordination. On the other hand, smaller teams are able to coordinate themselves more effectively

without formal coordination mechanisms. For example, people in a smaller team may pick up the telephone to arrange something with another member (they reported knowing when other teammates were available and willing to communicate). As a result, we hypothesize that this is the reason that the technology they chose to adopt facilitated collaboration rather than coordination. We

Technology choice			
I use the following techniques to communicate with team members between meetings:	**Smaller Team**	**Larger Team**	**F-value N=109**
Telephone conferencing combined with NetMeeting™	3.00(1.22)*	2.14(1.23)	F(3,91)=7.60, p<.001
eRoom™	2.50(1.44)	1.68(1.18)	
Web Meeting Manager™	1.20(0.61)	1.66(1.22)	

Table 8. Means and standard deviations in parenthesis for questions addressing technology

propose this relationship as a hypothesis to be addressed in a future study.

This study raises the question: what constitutes the boundaries of a distributed team? As Mark et al. [16] found, people from anywhere in a geographically distributed organization can connect to teams to participate in meetings. Rather than develop the expertise they needed to speak knowledgeably on a technical topic, the team members in the Mark et al study simply located the appropriate expert in the company and connected them to the team. With some types of technologies, it may be difficult to join a meeting (e.g. one must first obtain the right hardware and infrastructure). On the other hand, joining a meeting may be as simple as obtaining a telephone number and password for a teleconference via email. One consequence of such highly dynamic team membership is that core members of any given team may not be clear who the other members of the team are. There may, in fact, be levels of membership: core members and peripheral members. The study reported here targeted teams whose membership was well-defined, i.e. one's role in the team dictated one's responsibilities. What our study does not address is the emergent, and perhaps more realistic, team structure of fluid distributed team membership.

Some limitations of our study are that we only sampled teams from one large multinational corporation. It is not clear whether our results would generalize to other global corporations. Simcon is unusual in the attention that they pay to making distributed teamwork work. Other corporations may have resistance at some company sites, for example, in not allocating resources for hardware to use the appropriate technology in team meetings. However, we compared smaller with larger teams, and did not merely compute an absolute measure of team interaction and performance. We would nevertheless expect our results of the difference between larger and smaller teams to generalize. Another potential limitation is in how we defined "smaller" and "larger" teams. We deliberately used the terms smaller and larger to connote a comparison, so as not to label our teams small and large. It is not clear what constitutes a small team: a dyad, four people, or ten people? Similarly, it is not clear what constitutes a large team: fourteen people or one hundred? As we only tested these two groups (team sizes of 4-9 vs. team sizes of 14-19), we cannot say whether our results would hold for teams comprised of different sizes. For example, there may be a size threshold, above which the differences are no longer distinguishable.

Furthermore, we made every effort to have an unbiased sample, yet selection bias could have arisen from the fact that we administered our survey via the web (it's possible, for example, that only technically savvy individuals responded.). Also, an alternative explanation for our findings is that the larger teams who participated in our study were inherently different than smaller teams across task dimensions. For example, a relatively larger proportion of members of larger teams could serve in advisory capacities simply overseeing decisions. The larger proportion of work of this nature could affect the decision to adopt technology that mediates coordination. While our analysis of the qualitative responses collected about team tasks identified no systematic differences between large and small teams, differences cannot be entirely ruled out. Further examination of the 'goodness of fit' between team task and technology are warranted. Additionally, little data were available regarding the relative cost (monetary) of the technology. We cannot rule out cost as a factor, yet we know that the cost to deploy a given technology would be the same for all teams across the organization.

The findings from this study have implications for technology adoption. They suggest that certain types of teams may be more apt to adopt one kind of technology over another. We found that smaller teams adopted collaboration technology, while larger teams were more

apt to adopt technology designed to assist in their coordination efforts. Although technology use was entirely discretionary at Simcon, one can imagine a context where a mismatch exists between technology to team size. Some researchers have proposed that virtually colocated teams have unique technology requirements [18]. While we do not challenge this assumption, we put forth the possibility that some of these unique requirements might arise from factors, such as size, that are independent of the 'virtuality' of such teams. We also argue that an understanding of adoption patterns can assist us in our effort to 'design for adoption.' We posit, for example, that building communication functionality into meeting management software could increase levels of collaboration among large teams. By increasing collaboration, we refer to increasing the participation, commitment, and awareness of others. In other words, we recommend putting the most immediate need of large teams first – this being coordination technology – and technologically piggybacking communication functionality onto this. We predict that doing so would not only increase the levels of adoption of communication technology among larger teams, but also ultimately improve communication among those teams.

Our findings imply that the size of a distributed team does matter. Size is a factor in participation, awareness of others, technology choice, rapport, commitment and participation. Thus, when planning to implement distributed teams, and to deploy technology to support teams, size should be a consideration. To the extent that it highlights the adverse effects of large team size, this study represents a cautionary tale. One undeniable benefit of virtually colocated teaming is that adding members to a team requires little effort and cost relative to face-to-face teams. Our findings indicate that the lure of virtual collocation may, in fact, undermine their effectiveness when team size is permitted to expand unchecked. This study also represents the first step in identifying factors that affect the productivity of distributed teams. The mission of the Working Closer Team at Simcon is to develop technological and behavioral solutions to mitigate any adverse effects of distributed teaming. Further research into the effectiveness of such solutions is planned and anticipated to appear in future papers.

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