

An empirical study of best practices in virtual teams

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There is nothing quite so useless as doing with great efficiency that which should not be done at all.
Peter Drucker

Abstract

This study explores the issue of effectiveness within virtual teams — groups of people who work together although they are often dispersed across space, time, and/or organizational boundaries. Due to the recent trend towards corporate restructuring, which can, in part, be attributed to an increase in corporate layoffs, mergers and acquisitions, competition, and globalization, virtual teams have become critical for companies to survive. Globalization of the marketplace alone, for that matter, makes such distributed work groups the primary operating units needed to achieve a competitive advantage in this ever-changing business environment.

In an effort to determine the factors that contribute to/inhibit the success of a virtual team, a survey was distributed to a total of eight companies in the high technology, agriculture, and professional services industries. Data was then collected from 67 individuals who comprised a total of 12 virtual teams from these companies. Results indicated that several factors were positively correlated to the effectiveness of the participating teams. The teams' processes and team members' relations presented the strongest relationships to team performance and team member satisfaction, while the selection procedures and executive leadership styles also exhibited moderate associations to these measures of effectiveness. Analysis of predictor variables such as the design process, other internal group dynamics, and additional external support mechanisms, however, depicted weaker relations.

Although the connections between the teams' tools and technologies and communication patterns and the teams' effectiveness measures did not prove significant, content analysis of the participants' narrative responses to questions regarding the greatest challenges to virtual teams suggested otherwise. Beyond the traditional strategies used to enhance a team's effectiveness, further efforts directed towards the specific technology and communication-related issues that concern dispersed team members are needed to supplement the set of best practices identified in the current study. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Virtual teams; Internal group dynamics; External support mechanisms; Team effectiveness

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1. Introduction

Throughout the last two decades, many major corporations have been forced to question the way that their businesses were structured, often for the last

century or more. In response to the resurgence in corporate restructuring attributed to corporate layoffs, mergers and acquisitions, competition, and globalization, many vertically-aligned organizations are now focusing their efforts on designing more flexible and versatile structures to meet the demands of the changing marketplace. Corporate leaders have realized that much of the work people are now being asked to do requires, at the very least, some degree of communication and cooperation with others. In order to achieve business goals such as speed, cost, quality, or innovation, a flatter, more lateral organization is needed [8,16,22]. In fact, recent years have brought an outpouring of popular and scholarly literature about the use of computers in the workplace and how these emerging technologies can help promote collaborative work in groups by compressing space and time [5,18,19,21,24]. A well-designed team-based organization can expect to see better problem solving and increased productivity, effective use of company resources, better quality products and services, increased creativity and innovation, and higher quality decisions.

However, due to the inaccessibility of critical resources, especially information, the most well-designed organizational teams cannot always accomplish their objectives. This has led to the formation of *virtual teams* in which workers no longer need to work face-to-face, or even be co-located in the same place, in order to work together. In fact, these teams are able to perform their work without concern of space or time constraints since they are given access to the same technologies to communicate and coordinate their activities. These information technologies effectively link people together, despite their working at different times or in different locations, thus enabling them to communicate and share resources as needed.

This trend toward virtual teams has significantly altered the rigidity of organizational boundaries. One group of researchers describes the recent trend towards virtuality in the following manner.

During the hey-day of mergers and acquisitions of the 1980s, our notions of what constitute organizational boundaries began to change. The emerging era of transnationals, alliances, and metaorganizations may finish the job, assisted to a considerable degree by internal

and external communications networks. As a result, organizational boundaries have grown increasingly permeable and difficult to identify.

Due to these complex variables, virtual teams can prove very challenging to maintain. Furthermore, achieving the business objectives and turning value from these relationships can be difficult. Even if the connections are established and trust develops among participants, a set of business processes based on information and communications technologies that can foster success with these flexible, dispersed, information-intensive organizations is needed [10].

2. Purpose of the study

The intention of this study was to determine which of these practices led to, or inhibited, the success of the participating virtual teams. By examining the design techniques that were used to form virtual teams, the internal dynamics that existed within them, and the organizational resources that were used to support them, the current research proposed to help organizations achieve their business objectives in the most efficient and cost-effective manner. Furthermore, this study planned to verify the previous research findings as well as advance the literature by identifying productive directions for future research.

3. Literature review and key definitions

Teams are groups of people who share a common purpose or goal and interact interdependently within a larger organizational setting [7,11,15,27]. Unlike their conventional counterparts, virtual teams can be dispersed across organizational, space, and/or time boundaries and are often cross-functional in nature, where team members come from a variety of organizational departments or business units. Consequently, these teams have a low frequency of face-to-face contact and are able to collaborate through the use of emerging computer and communication technologies. For this reason, the team's sense of a shared purpose can become the only unifying icon for the team since "... virtual teaming involves tapping into world class competencies, wherever they can be accessed, electronically".

Regardless of these challenges, many organizations are turning to virtual teams to help them meet the demands of the new business environment. A recent Department of Transportation report estimates that at least 8.4 million US workers are currently members of dispersed teams and that by the end of 1998, this number should exceed 13 million, and exceed 30 million by the year 2000 [1,12].

For the purposes of this study, a virtual team is only recognized as such if all of the team members perform the majority of their work from different locations. This distance makes interactions between team members, other than electronic communications, no longer feasible. In addition, a single team member choosing to perform some of his or her work from a remote site does not create a virtual team arrangement.

Kossler and Prestridge [14] maintain that virtual teams are brought together to focus on a specific project, e.g. short-term work arrangements, and must be distributed across functional, or organizational, lines as well as geographic boundaries. However, our study does not limit the definition of a virtual team to the type of work task the team performs, the length of time the team remains together, or the membership span across multiple functional or departmental lines and geographic areas.

4. A framework for assessing team effectiveness

Much of the current research on team effectiveness stems from the original research conducted on small

group interactions. Since technology profoundly affects the nature of group work [4,13,23,25], it is inappropriate to generalize the outcomes from non-computer-supported work groups to the computerized environment. A better approach is to take a meta-view of the research, as illustrated in Fig. 1 [3,20]. Meeting outcomes (e.g. efficiency, effectiveness, satisfaction) depend upon the interaction within the meeting process of the group (e.g. group size, group proximity, group composition, group cohesiveness, etc.), task (e.g. idea generation, decision choice, task complexity, etc.), context (e.g. organizational culture, time pressure, reward structure, etc.), and technology factors that differ from situation to situation.

More specifically, with regards to team effectiveness, there are three basic criteria to consider according to researchers prominent in this field [17,28]. The first, and possibly most obvious, is the team's productivity level. Second, a team's ability to learn and improve its functioning thus sustaining itself over time can be evaluated. The extent to which a team is able to provide satisfaction to its individual members along any number of intrinsic measures is the third dimension.

The first criteria relates to the team's actual performance: the extent to which the group's output, product or service, meets the required standards. These are often set by a supervisor who must review the output or evaluated by a customer who receives the product/service. Thus, someone beyond the team's boundaries is responsible for judging its level of effectiveness.

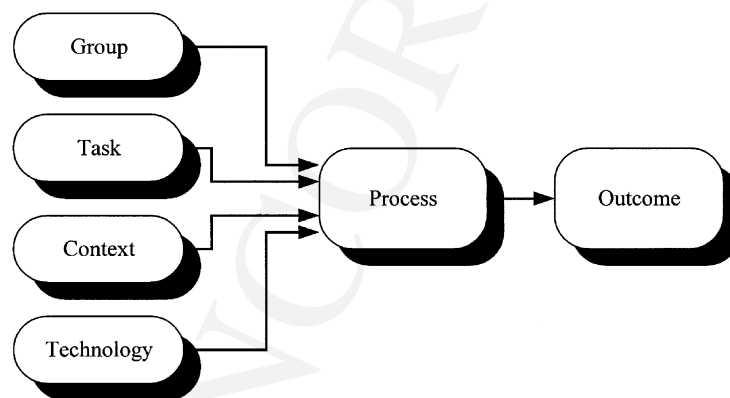


Fig. 1. Meta-level research model.

An example using the standard of quantity would be if one examined an objective measure, such as the actual amount of output or archival data based on production. In other words, the sheer quantity of product a team generates can be used to signify a team's effectiveness. An alternative to this approach would be to evaluate the quality of the product generated or service provided by the team. Having a manager, or even a customer, rate the quality of a product or service is a more subjective appraisal of effectiveness.

The second criterion is based on the process of conducting the work, not the actual outcome that is generated. This dimension centers on the team's ability to learn and therefore improve itself and its members while conducting its work. Hackman [11] writes, "The second dimension is the degree to which the process of carrying out the work enhances the capability of members to work together interdependently in the future". This factor, then, does not focus on the present condition of the group but instead concentrates on the ability to perform in a future state.

The third criteria is also a process variable, but this one relates more directly to the individuals within the team. This final dimension addresses the team members' level of satisfaction. As a social network, the team has an additional responsibility beyond simply completing the assigned task: it must also care for its members and provide the right opportunities for personal development and growth.

Clearly, given this framework of how team effectiveness can be assessed, there are many methods that can be used to characterize effectiveness within a team setting. One can identify an output measure by examining either objective reports that represent quantifiable data or subjective perceptions that exhibit the level of quality. On the other hand, effectiveness can be evaluated based on the process the team undergoes.

Researchers have shown that teams will not, and for that matter cannot, be effective if the team members themselves are not satisfied with the way the team functions. Mohrman and coworkers [19] reinforce the significance of this personal need in writing, "This dimension (of satisfaction) was important to the companies we studied: they feared that in the large-scale transition to a team organization, they would lose the commitment of their employees as a result of the demands and stresses of learning to

perform effectively in teams and the uncertainty employees felt about how they would fare in a team organization".

Although this, too, is a subjective measure of perceptions, it is at least the outlook of those who are doing the work. While there may not be a perfect correlation between team member perceptions of effectiveness and company standards, or even other industry measures of quality control for that matter, asking team members for their impressions can provide a conclusive account of how well a team will perform. In fact, a study by Campion and coworkers [2] shows that team member perceptions can be extremely valid predictors of the team's effectiveness since team members are central to the work, and thus, they directly influence the team's productivity and satisfaction. Fig. 2 illustrates the framework for virtual teams that integrates the basic design and group dynamics factors and the external support factors necessary in a distributed virtual environment.

While the outcome measures such as productivity or quality can only be established after the fact, a process measure of team effectiveness allows the assessment of effectiveness midstream, while the work is still being performed. In doing so, it may be possible to provide the information needed to assess the early stages of development for a virtual team.

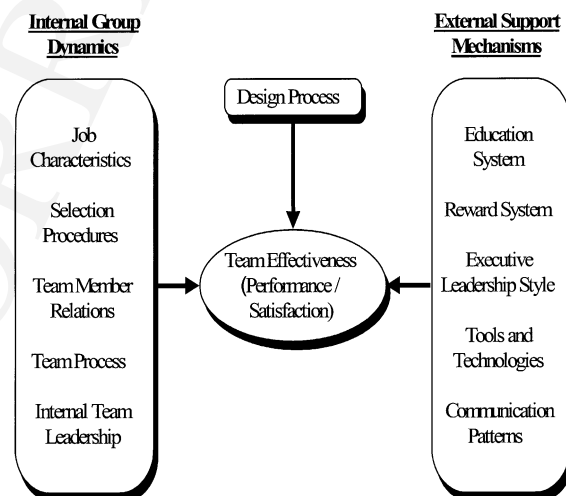


Fig. 2. Model of predictor variables expected to impact effectiveness of virtual teams.

5. Research methodology

This exploratory study with no a priori hypotheses was conducted using a survey methodology. The research framework adopted for this study was first used as a basis for a literature survey and the generation of a preliminary instrument. The constructs to be measured in this study were operationalized based on the studies mentioned in the literature review. This instrument was pre-tested with a small group of virtual team members who were not used in the final survey. After some basic analysis of the reliability of each of the preliminary scales, this instrument was modified and used to capture data in a cross-sectional survey. The virtual teams survey questionnaire (see Appendix A) was distributed to 12 separate virtual teams from eight different sponsor companies in the high technology, agriculture, and professional services industries. The 67 individuals who participated in this research came from a variety of professional settings, including research, product development, sales, marketing, legal support, and management consulting, and they worked in distributed teams that stretched across the United States as well as to several countries in Europe and Asia. A list of companies and team descriptions is presented in Appendix B. In addition to this demographic information, a number of other significant characteristics of the research population are also worth noting due to their importance to the design of this study.

First, the individuals who participated in this study worked for several different companies. Although a number of the virtual teams did, in fact, work for the same company, it was necessary to evaluate teams from multiple companies to increase the validity of the results, as well as improve the ability to generalize them to a greater population. For this reason, several organizations were contacted. Of those, the companies that agreed to participate were in the high-technology, agricultural, and professional services industries. Furthermore, the participating teams from these companies greatly differed. Their primary work assignments ranged from short-term projects to long-term, and even permanent, assignments and were based in research, product development, sales and marketing, legal support, and management consulting.

Second, members of these teams performed their work from many different company sites. In order to assess the teams' overall performance, it was critical to evaluate the entire team perspective. Since the nature of this study demanded that all team members, including those from different work locations, participate in the research, then a representative sample from all of the teams' workplaces was needed. Consequently, the individual team members performed their work in company locations spanning across the United States as well as several countries in Europe and Asia.

Third, and possibly more important than the previous traits, these team members were all self-selected by their sponsor organizations based on their work roles as members of existing virtual teams. All subjects, then, were knowledgeable of the virtual team environment and were capable of providing the necessary feedback for this investigation.

Thus, the virtual teams were of different types (i.e. short-term and long-term, work teams and project teams, etc.), they came from different market segments (i.e. high-technology, agriculture, and professional services), and they spanned vastly different geographic and time boundaries (i.e. regional/multi-state teams and transnational teams, single time zones and multiple time zones).

Two separate measures of team effectiveness were established in the survey. The first scale related to the teams' abilities to perform their work assignments. The second concentrated on the team members' levels of satisfaction while working with their virtual teams.

The survey also consisted of several predictor variables that were identified for their potential impact on the teams' effectiveness. First, the design process itself was stipulated to have an association to the teams' future actions. Moreover, job characteristics and selection procedures, team member relations, and the teams' processes and internal team leadership were designated as possibly being critical factors beyond the actual design process.

In addition to these group dynamics, a number of organizational support systems were predicted to affect the teams' abilities to achieve their objectives. These support mechanisms included the established education and reward systems, the organizations' senior leadership styles, the teams' tools

Table 1
Mean scores for predictor variable and main criteria scales^a

Category	Scale	Mean score
Predictor variable	Job characteristics	3.47
Internal group dynamics	Internal team leadership	3.01
	Selection procedures	2.85
	Team member relations	2.83
	Team process	2.71
Predictor variable	Executive leadership style	3.17
External support mechanisms	Reward system	3.03
	Tools and technologies	2.95
	Education system	2.69
	Communication patterns	2.53
Predictor variable — design	Design process	2.78
Main criteria — effectiveness	Team member satisfaction	3.14
	Overall team performance	2.87

^a Values — 4: strongly agree; 3: agree; 2: disagree; 1: strongly disagree; 0: not applicable.

and technologies, and the teams' communication patterns.

Analysis of the predictor variable and main criteria scales was conducted. This evaluation provided information regarding the team members' perceptions of how well their teams and organizations were functioning (see Table 1). Note that the "not applicable" responses were not rated when calculating the mean statistics. These responses were treated as missing items and were dropped from the final analysis. Team members provided positive feedback with regards to the job characteristics and internal leadership of their teams. The executive leadership styles and reward systems also ranked strongly among the external support mechanisms for these teams. Given these work conditions, participants exhibited high levels of satisfaction with their virtual team experiences and moderate levels of overall team performance.

5.1. Associations between predictor variable and main criteria scales

In addition to the descriptive statistics already mentioned, Pearson's product-moment correlations between the scale measurements of the predictor variables and both the performance and satisfaction measures of effectiveness were performed and revealed several substantial associations. Table 2 lists

the reliability coefficients for the predictor variable and main criteria scale measurements. The relationships between these measurements, including those that did not prove statistically significant, are presented in Table 3.

Analysis of team performance and team member satisfaction, the two measurements for the main criteria effectiveness, indicated a high correlation to each other. In addition, examination of the data depicted strong associations between two of the predictor variables and these criteria scales. Both team process

Table 2
Reliability coefficients for predictor variable and main criteria scales

Scale	Reliability coefficient
Design process	0.66
Job characteristics	0.80
Selection procedures	0.71
Team member relations	0.82
Team process	0.82
Internal team leadership	0.79
Education system	0.73
Reward system	0.67
Executive leadership style	0.83
Tools and technologies	0.79
Communication patterns	0.60
Overall team performance	0.82
Team member satisfaction	0.82

Table 3
Pearson correlations between predictor variables and performance and satisfaction measures of effectiveness^a

Predictor variables	Performance	Satisfaction
Team performance	–	0.73
Team member satisfaction	0.73	–
Team process	0.68	0.64
Team member relations	0.62	0.73
Selection procedures	0.58	0.53
Executive leadership style	0.53	0.46
Internal team leadership	0.51	0.45
Reward system	0.46	0.51
Communication patterns	0.48	0.37
Education system	0.46	0.41
Job characteristics	0.43	0.32
Design process	0.32	0.36
Tools and technologies	0.26	0.42

^a All Pearson correlations reported are two-tailed tests, $P < 0.01$ (with the exception of tools and technologies with performance, $P < 0.05$).

and team member relations exhibited significant positive correlations with both the performance and satisfaction measures of effectiveness.

Furthermore, two of the predictor scales displayed moderate associations to the two criteria measurements. The scale for selection procedures as well as the one for executive leadership style showed a fair connection to the performance and satisfaction scales of effectiveness.

The remaining predictor variables revealed weaker relationships to the team performance and team member satisfaction measures of effectiveness. The correlations between the internal team leadership measure and the reward system scale, however, did present moderately stronger associations. At the same time, the relationships between each of these measures and the individual scales of team effectiveness varied. The internal team leadership scale presented a stronger relationship to the performance measure, while the reward system scale exhibited a stronger relationship to the satisfaction measure.

Finally, the predictor variables such as communication patterns, education system, job characteristics, design process, and tools and technologies did not depict substantial relations. Thus, they indicate smaller effects on the teams' effectiveness, regardless of whether one uses the performance or the satisfaction scale.

Table 4
Pearson correlations between individual communication tools and performance and satisfaction measures of effectiveness^a

Communication tools	Performance	Satisfaction
Video conferencing	–0.43	–0.23
Voice mail	–0.24	–0.38

^a All Pearson correlations reported are two-tailed tests, $P < 0.01$.

To validate the lack of relationship exhibited between the tools and technologies the teams used and the communication patterns enacted between team members and the measures of team effectiveness, the correlations between each of the individual information and communication technologies used by the teams and the overall team performance and the levels of team member satisfaction were also examined. These tests also indicated insignificant relationships between the teams' tools and communication patterns and their resulting effectiveness. In fact, the only relationships which suggested substantial connections, those between video conferencing and performance and voice mail and satisfaction, depicted negative correlations between the technologies and the effectiveness measures (see Table 4).

Analysis of the Pearson's product-moment correlations also indicated a number of positive relationships between the predictor variables themselves. The teams' processes had significant associations to team member relations, selection procedures, the reward system, and the design process, respectively (see Table 5). Likewise, team member relations showed moderate connections to the internal team leadership and the teams' selection procedures (see Table 6).

Also, the two measures of leadership, internal team leadership and executive leadership style, as well as the two measures of organizational systems, the education and reward systems, exhibited strong to moderate associations to each other (see Tables 7 and 8).

In addition to these measurements, narrative responses to the final two questions on the survey addressed some of the greatest challenges with which virtual teams are often faced. Data reduction and content analysis performed on these short-answer responses revealed that a number of communication-related issues were of primary concern (see Tables 9 and 10).

Table 5
Pearson correlations between predictor variables and team process^a

Predictor variables	Team process
Team member relations	0.69
Selection procedures	0.60
Reward system	0.53
Design process	0.50

^a All Pearson correlations reported are two-tailed tests, $P < 0.01$.

Table 6
Pearson correlations between predictor variables and team member relations^a

Predictor variables	Team member relations
Team process	0.69
Internal team leadership	0.56
Selection procedures	0.54
Design process	0.50

^a All Pearson correlations reported are two-tailed tests, $P < 0.01$.

First, a majority of the respondents stated that the lack of face-to-face interaction made virtual work difficult. Also, electronic communication proved troublesome for these teams because team members invariably needed to determine which tools were most appropriate to use based on situational factors like the content of the message as well as the intended audience.

To further assess these concerns with communication, the frequencies with which these teams used a variety of tools and information technologies to exchange routine business information were calculated. (see Table 11). The results of this analysis showed that the participating virtual teams were

Table 7
Pearson correlations between predictor variables and internal team leadership^a

Predictor variables	Internal team leadership
Executive leadership style	0.62
Team member relations	0.56

^a All Pearson correlations reported are two-tailed tests, $P < 0.01$.

Table 8
Pearson correlations between predictor variables and education system^a

Predictor variables	Education system
Reward system	0.71
Tools and technologies	0.50

^a All Pearson correlations reported are two-tailed tests, $P < 0.01$.

Table 9
Frequency scores of response categories for question regarding greatest challenges for virtual teams^a

Categories	Frequency of response (%)
Communication patterns	39.4
Team member relations	28.8
Design process	15.2
Geographic dispersion	12.1

^a Frequency scores are based on 67 total responses ($n = 67$).

dependent upon the use of individual communication tools such as e-mail, personal telephone calls, and voice mail, all of which were, on average, used frequently by team members. In fact, e-mail was so prominent for these teams that 80% of the team members communicated via e-mail daily.

On the other hand, team-based communication technologies like group telephone conferences, face-to-face interaction, shared databases, groupware applications, and video conferences were not often used. These tools were used merely once a month by an overwhelming majority of these team members, and less in some cases. Moreover, video conferencing, the one tool that could possibly mitigate the teams' difficulties related to infrequent face-to-face interaction by bringing team members together electroni-

Table 10
Frequency scores of response categories for question regarding greatest challenges for effective communication between virtual team members^a

Categories	Frequency of response (%)
Communication patterns	34.9
Team process	31.7
Team member relations	27.0
Geographic dispersion	6.3

^a Frequency scores are based on 62 total responses ($n = 62$).

Table 11
Mean scores for frequency of use of tools and technologies to exchange routine business information^a

Tools	Frequency of use
E-mail	4.77
Personal telephone call	3.74
Voice mail	2.95
Group telephone conference	1.97
Shared databases/groupware	1.92
Standard/express mail delivery	1.86
Fax	1.86
Face-to-face interaction	1.80
Video conference	0.29

^a Frequency values — 5: daily; 4: a few times a week; 3: once a week; 2: once a month; 1: less than once a month; 0: never/not applicable.

cally, was not used by, and possibly not even available to, 86% of the team members. Video conferencing may prove effective in bringing remote members together if made available to the teams, and this might be a fruitful area for future research. At the same time, personal communications with some participants of this study revealed that video conferencing technologies were not made available because they failed to bring about the same impact as face-to-face interaction, thus negating any conclusions towards the efficacy of video conferencing. A profile of virtual team members and their virtual teams is illustrated in Appendix C, Table 12.

Further analysis was conducted to determine if the responses varied between the national and transnational teams, i.e. if the varying cultures influenced the findings. The Pearson correlations of the US/national teams ($n = 46$) were similar to the overall results. The correlations to team effectiveness (both performance and satisfaction measures) indicated strongest relations with team process and team member relations and moderate relations with selection procedures and executive leadership style. Other correlations between predictor variables were also present.

In the transnational teams ($n = 21$), team process and team member relations indicated strongest relations with team effectiveness, but not both its measures (i.e. either performance or satisfaction). Also, internal team leadership and communication patterns indicated moderate relations with team effectiveness. The results suggest much weaker relations between

team effectiveness and selection procedures and executive leadership style. Other correlations between predictor variables were also present. The details of the analysis of the US/national and transnational teams are shown in Appendix C, Tables 13 and 14. The summary of results and conclusions of the analysis of the US/national and transnational teams is also provided in Appendix C after Tables 13 and 14 (text part). Finally, the mean scores for frequency of use to exchange business information are illustrated in Appendix C, Table 15 followed by a summary of its results.

6. Limitations of the study

Before making any general conclusions or recommendations, it is necessary to address some of the limitations of the study. One limitation is the sampling method: the selection of sponsor organizations, and thus participating virtual team members, was not random. This may have affected the results.

However, a random sampling was not an option. Given a firm belief that only those people who work within the virtual setting would be knowledgeable, and therefore capable of providing the necessary feedback, purposeful selection of participants was essential. For this reason, the sample population was limited to only those people who did work in virtual teams.

In addition, the characteristic nature of the participating teams might have directly impacted on the scope of this research. The virtual teams which participated were of different types, came from different market segments, and spanned vastly different. Based on the diversity of these teams, it is difficult to determine whether or not the current findings were grounded in any one of these distinguishing traits, or possibly even the interaction between them all.

An important caveat is that the tasks performed were uncontrolled. The nature of the tasks may have been such that average and superior teams would produce the same performance, thereby masking some of the effects. For example, on an easy test, both average and superior students turn in perfect papers, and only the poor students are identified by the test.

A final reservation centers on the survey instrument and, in particular, the items that were used to define the

predictor variable and main criteria scales themselves. Due to the comprehensive nature of the survey, the instrument was designed to address several variables. Based on this intent, some of the scales that were developed to assess the predictor variables may be insufficient to provide absolute data. For example, the reward system and communication patterns scales contain only two items and indicate only moderate levels of reliability.

7. Conclusion and recommendations

Although these limitations may impact the ability to generalize the findings of this study, several conclusions are still warranted. First, the research was successful, not only in addressing the issue of effectiveness within these virtual teams but also determining a number of critical success factors for them. Since the participants came from a wide variety of industries, types of work tasks, and geographic settings, the results are fairly generalizable for an exploratory study. Based on the results of this study, organizations choosing to implement virtual teams should focus much of their efforts in the same direction they would if they were implementing traditional, co-located teams.

Much of the data resulting from the research suggests that many of the issues that affect virtual teams are similar in nature to those that affect co-located teams. This study has demonstrated that virtual teams are first and foremost teams. As such, they must have a shared purpose to foster the need for members to work together. If these joint goals are present, then team members must rely on each other to perform their work.

According to the quantitative data resulting from the correlational analyses, team leaders need to establish positive team processes, develop supportive team member relations, create team-based reward systems, and select only those team members who are qualified to do the work. These predictor variables exhibited the strongest associations to team effectiveness. These factors, then, clearly constitute the beginnings of a comprehensive set of best practices to be used when designing and supporting effective teams, regardless of whether they are co-located or virtual. In addition, though, virtual teams require added con-

nectivity between team members because of the vast distances that separate them. Therefore, a number of specific efforts should be targeted towards enhancing the effectiveness of virtual teams. In particular, formal processes must be developed. Due to the physical barriers involved with virtual work, a number of the narrative responses suggested that these teams require more structure to perform their work. In addition, the individual team members' roles and the teams' primary objectives must be explicit, not simply assumed. Without a crystal-clear understanding of their goals, "the progress of (team) members will be stymied", according to one of the virtual team members.

Furthermore, strategies specific to virtual teaming must address several communication issues. Although the correlations between the teams' tools and technologies and communication patterns and the two measures of effectiveness were insignificant, additional analyses such as content analysis of the participants' narrative responses to questions regarding the greatest challenges to virtual teams suggested that more consideration of these factors is needed. Many of the participants addressed the need for more personal contact to establish supportive team member relations, which have been recognized as critical to improving the success of teams. In fact, one management consultant who participated in the study stated, "Knowing someone on a face-to-face level and creating relationships with them through social interactions outside of work really helps each individual understand the strengths throughout a team."

Virtual team leaders may want to consider utilizing more face-to-face interaction and other group communication technologies, such as group telephone and on-line computer conferencing as well as video conferencing, to enhance personal connections between team members. To make matters more complicated though, virtual team members need everything to be reinforced in a much more structured, formal process. Due to this fact, organizational leaders who try to improve the performance of their virtual teams by simply providing them with more advanced technologies may be misdirecting their resources. The study shows that several other factors have a more pronounced effect on effectiveness.

Finally, this research study focused on the big picture of virtual teaming. Through the use of corre-

lational and narrative data, this investigation attempted to determine some general guidelines to assist organizations in enhancing their virtual team efforts. Clearly, these results can be generalized to a broad population of virtual teams because so many different team variables exist within the sample population. Due to the exploratory nature of the study, it did not necessarily address the specific situational contexts that influenced the participating virtual teams.

Although the results from the investigation could apply to a larger population of all existing virtual teams, it is also possible that specific circumstances require particular attention be paid to any one of the best practices. Until corporate leaders begin implementing the recommendations from this study across different situational contexts as they first conceive the notion of designing virtual teams, one will not know which of these practices is best suited to designing and supporting effective virtual teams across any given situation.

Information and communication technologies tend to gain recognition from those in virtual teams when they breakdown. Team members do not often pay particular attention to their tools until they stop working. At the same time, more advanced technologies, such as software packages which provide “virtual space” for on-line, electronic team conferences, are

currently being developed and constantly coming to market. With these improved tools, the interpersonal connections between distributed team members could be significantly improved, thus making collaborative work easier.

At their core, virtual teams are dependent upon such communication and information technologies to perform their most routine tasks. The results of the present research have demonstrated that virtual teams must create dependable processes and strong interpersonal relationships if they are to achieve their objectives. Teams could be more effective if more advanced technologies were available, however, the technologies are only a partial factor. Being equipped with even the most advanced technologies is not enough to make a virtual team effective, since the internal group dynamics and external support mechanisms must also be present for a team to succeed in the virtual world. These dispersed work groups, then, must take ample time during the initial design phases to consider their future goals and develop healthy and supportive environments if they are to reach their complete potential.

Uncited references

[6,9,26].

Appendix A. Survey instrument

Virtual Teams Survey

PURPOSE

The purpose of this survey is to gather information regarding the virtual team of which you are a member. It is important for us to understand how virtual team members think and feel as your company continues to grow and change. Only with this awareness will it be possible to address any areas of concern or those that need improvement.

More specifically, we have three primary goals with this survey. First, we hope to learn what methods were used to design your virtual team. Second, we would like to review what systems your organization established to better support your team. Third, we expect to determine how these factors have, or have not, helped your team succeed in achieving its business objectives.

YOUR PARTICIPATION

In order to accomplish these goals, we need your complete and honest participation. For this reason, we ensure complete confidentiality for everyone who completes this survey. Responses from all of the completed surveys will be pooled together so that no one individual can be identified. We ask for your name at the conclusion of the survey merely to allow us to conduct follow-up research – Providing your name, however, is completely optional.

SURVEY RESULTS

Finally, in an effort to keep everybody informed and create a stronger team environment, the results of this survey, as well as those completed by members of other virtual teams, will be summarized in a final report upon completion of this research project. This report will then be shared with all teams who participate in this process. Thank you, in advance, for your honest responses.

DIRECTIONS

The virtual teams survey will take approximately 20 – 30 minutes to complete. Please follow the instructions on the survey itself and indicate your responses accordingly.

Strongly Agree Agree Disagree Strongly Disagree Not Applicable

Example:

I was invited to participate in the formation of this team. () (X) () () ()

SECTION I. The first section of this survey asks you questions specifically about the design of your virtual team. Please keep in mind the manner in which your team was designed as you respond to questions 1 – 41.

Questions 1 - 9 ask you for specific information about your virtual team and how it was formed.

- | | Strongly
Agree | Agree | Disagree | Strongly
Disagree | Not
Applicable |
|--|-------------------|-------|----------|----------------------|-------------------|
| 1. I was invited to participate in the formation of this team. | () | () | () | () | () |
| 2. Team members were asked for their suggestions when the team was originally formed. | () | () | () | () | () |
| 3. Careful consideration was given to the team's objectives during the design of this team. | () | () | () | () | () |
| 4. Those who designed the team considered the larger organization as well as the team itself. | () | () | () | () | () |
| 5. I received sufficient information to understand the team's purpose when I was notified about being a member of this team. | () | () | () | () | () |
| 6. My role on the team was clearly explained to me during this notification. | () | () | () | () | () |
| 7. New team members are quickly brought up to speed when they join the team. | () | () | () | () | () |
| 8. New team members can access critical information to learn about the team's history and earlier work. | () | () | () | () | () |
| 9. I was notified that I would be a member of this team through the following means. <i>Please mark all that apply.</i> | | | | | |
| ___ Peer/Co-worker ___ My Supervisor ___ Other Supervisor ___ Volunteered | | | | | |
| ___ Paper Memo ___ Fax ___ Email ___ Phone ___ Other _____(please specify) | | | | | |

Questions 10 - 16 ask about the characteristics of your job and how people were selected to be members of the team.

- | | Strongly
Agree | Agree | Disagree | Strongly
Disagree | Not
Applicable |
|---|-------------------|-------|----------|----------------------|-------------------|
| 10. I gain intrinsic reward and satisfaction from my job. | () | () | () | () | () |
| 11. I find that I am challenged by my work. | () | () | () | () | () |
| 12. My job gives me the opportunity to develop my knowledge and skills. | () | () | () | () | () |
| 13. I am able to add value to the team's work. | () | () | () | () | () |
| 14. Team members were selected based on their individual talents and abilities to contribute to the team. | () | () | () | () | () |

- | | Strongly
Agree | Agree | Disagree | Strongly
Disagree | Not
Applicable |
|---|-------------------|-------|----------|----------------------|-------------------|
| 15. When selected, team members were technically competent with the tools we use to perform our work and interact with one another. | () | () | () | () | () |
| 16. Team members were selected simply because they were not otherwise committed and were available to work on this assignment. | () | () | () | () | () |

Questions 17 - 25 ask about the team member relations within your team.

- | | Strongly
Agree | Agree | Disagree | Strongly
Disagree | Not
Applicable |
|---|-------------------|-------|----------|----------------------|-------------------|
| 17. Team members were given the opportunity to meet each other in person early on in the team's development. | () | () | () | () | () |
| 18. During the team's first meeting, some time was dedicated to discussing the team's purpose and goals . | () | () | () | () | () |
| 19. During the team's first meeting, some time was dedicated to team building exercises such as meeting individual team members, creating effective team communication, and/or discussing conflict resolution. | () | () | () | () | () |
| 20. I rely upon other team members to complete my assigned work. | () | () | () | () | () |
| 21. Team members trust one another and will consult each other if they need support. | () | () | () | () | () |
| 22. Team members experience a sense of shared goals and objectives. | () | () | () | () | () |
| 23. Knowledge and information sharing is understood to be a group norm within my team. | () | () | () | () | () |
| 24. Our team is a very cohesive unit. | () | () | () | () | () |
| 25. When disagreements occur, they are usually addressed promptly in order to solve them. | () | () | () | () | () |

Questions 26 - 41 ask about the team's process.

- | | Strongly
Agree | Agree | Disagree | Strongly
Disagree | Not
Applicable |
|--|-------------------|-------|----------|----------------------|-------------------|
| 26. Face-to-face team meetings are held whenever possible so people can discuss things together. | () | () | () | () | () |
| 27. Time is dedicated to developing social relations as | | | | | |

	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
well as addressing business issues during these face-to-face meetings.	()	()	()	()	()
28. Team members regularly use phone and/or on-line computer conferences to share ideas.	()	()	()	()	()
29. Time is dedicated to developing social relations as well as addressing business issues during these electronic conferences.	()	()	()	()	()
30. The team established a trend of success early on.	()	()	()	()	()
31. The team celebrates its successes.	()	()	()	()	()
32. Team members were able to recognize our collective talents and utilize them from the beginning.	()	()	()	()	()
33. Team members have a shared understanding of what the team is supposed to do.	()	()	()	()	()
34. We are clear on how best to perform our work tasks.	()	()	()	()	()
35. Our team has an established process for making decisions.	()	()	()	()	()
36. Team members use their own judgment in solving problems.	()	()	()	()	()
37. The team's leaders offer new ideas or approaches to do our jobs better.	()	()	()	()	()
38. The team's leaders are friendly and can be easily approached.	()	()	()	()	()
39. Team members feel that the team's leaders are helpful and supportive.	()	()	()	()	()
40. The team's leaders make sure team members have clear goals to achieve.	()	()	()	()	()
41. The team's leaders keep individuals working together as a team.	()	()	()	()	()

SECTION II. The second section of this survey asks you questions specifically about the systems your organization uses to support your virtual team. Please keep these organizational support systems in mind as you respond to questions 42 – 61.

Questions 42 - 49 ask about the organizational environment in which your team operates.

	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
42. The organization has a strong educational system.	()	()	()	()	()
43. I receive sufficient training from the organization to develop my core skills.	()	()	()	()	()
44. Since the team's formation, team members have received training focused on becoming more effective in the virtual team setting.	()	()	()	()	()
45. Training is based on only technical skills such as using specific software applications or issues like product knowledge.	()	()	()	()	()
46. Training seminars were developed specifically to help us communicate effectively with our fellow team members who work in dispersed locations.	()	()	()	()	()
47. I am rewarded individually for my work efforts.	()	()	()	()	()
48. All team members are rewarded when the team reaches its goals.	()	()	()	()	()
49. Our team is well supported by the organization.	()	()	()	()	()

Questions 50 - 55 ask about the leadership of your organization.

	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Applicable
50. The organization's leaders have created a vision for the company.	()	()	()	()	()
51. This vision is articulated to all members of the organization.	()	()	()	()	()
52. The management approach in our organization promotes initiative in team members.	()	()	()	()	()
53. Individuals are encouraged to take initiative and participate in important decisions.	()	()	()	()	()
54. The organization's leaders are competent with and serve as positive role models in the use of our communication technologies.	()	()	()	()	()
55. Management encourages the use of electronic communication and information systems.	()	()	()	()	()

Questions 56 - 61 ask about the tools and technology your team uses and its methods of communication.

- | | Strongly Agree | Agree | Disagree | Strongly Disagree | Not Applicable |
|--|--|-------|------------------------|-------------------|----------------|
| 56. I have access to all of the information I need to perform my work. | () | () | () | () | () |
| 57. The team is equipped with adequate tools and technologies to perform our tasks. | () | () | () | () | () |
| 58. Team members are in contact with one another on a regular basis in order to conduct routine business. | () | () | () | () | () |
| 59. Team members are in contact with one another on a regular basis for social, or non-business, purposes. | () | () | () | () | () |
| 60. The electronic methods we use to communicate with one another are effective. | () | () | () | () | () |
| 61. Please indicate the frequency with which you use the following tools for exchanging routine business information with fellow team members. | | | | | |
| | 0 = Never / Not applicable | | 3 = Once a week | | |
| | 1 = Less than once a month | | 4 = A few times a week | | |
| | 2 = Once a month | | 5 = Daily | | |
| <input type="checkbox"/> Face-to-face interaction | <input type="checkbox"/> Group Telephone Conference | | | | |
| <input type="checkbox"/> Personal Telephone Call | <input type="checkbox"/> Video Conference | | | | |
| <input type="checkbox"/> Voice Mail | <input type="checkbox"/> Shared Databases / Groupware (i.e. LotusNotes®) | | | | |
| <input type="checkbox"/> Fax | <input type="checkbox"/> Standard / Express Mail Delivery | | | | |
| <input type="checkbox"/> E-mail | <input type="checkbox"/> Other _____ (please specify) | | | | |

SECTION III. The third section of this survey asks you general questions about your virtual team. Please keep your virtual team in mind as you respond to questions 62 – 84.

Questions 62 - 70 ask you for information about the overall performance of your team and the level of satisfaction of the team members.

- | | Strongly Agree | Agree | Disagree | Strongly Disagree | Not Applicable |
|--|----------------|-------|----------|-------------------|----------------|
| 62. In the past, the team has been effective in reaching its goals. | () | () | () | () | () |
| 63. The team is currently meeting its business objectives. | () | () | () | () | () |
| 64. When the team completes its work, it is generally on time . | () | () | () | () | () |
| 65. When the team completes its work, it is generally within the budget . | () | () | () | () | () |
| 66. There is respect for individuals in the team. | () | () | () | () | () |
| 67. I feel my input is valued by the members of the team. | () | () | () | () | () |

68. Team member morale is high in the team. () () () () ()
69. I enjoy being a member of this team. () () () () ()
70. In the future, I would be interested in participating in another virtual team. () () () () ()

Questions 71 - 82 ask you for general information about you, your team, and your organization. Please respond to each question as indicated.

71. Name of the organization. _____
72. Your position in the organization. *Please mark only one choice.*
- | | |
|---|---|
| <input type="checkbox"/> Administrative Support | <input type="checkbox"/> Individual Contributor (i.e. Consultant, Sales Rep.) |
| <input type="checkbox"/> Manager / Supervisor | <input type="checkbox"/> Director |
| <input type="checkbox"/> Vice President | <input type="checkbox"/> Senior Executive |
| <input type="checkbox"/> Other _____ | |
73. In the last year, how many teams have you participated in where **all** team members were based in the **same location**? _____
74. In the last year, how many teams have you participated in where some of the team members were dispersed **across different locations**? _____
75. Name of the virtual team you referred to in this survey. _____
76. Total number of team members on this team. _____
77. Your position in relationship to this team. *Please mark only one choice.*
- | | |
|--|--------------------------------------|
| <input type="checkbox"/> Team Member | <input type="checkbox"/> Team Leader |
| <input type="checkbox"/> External Team Supporter | <input type="checkbox"/> Other _____ |
78. How long has this team been in existence? _____ years _____ months
79. How long have you been a member of this team? _____ years _____ months
80. Have you been a member of this team since its inception? _____ Yes _____ No
81. How would you describe this team? *Please mark all that apply.*
- | | |
|---|--|
| <input type="checkbox"/> R&D, Sales (i.e. Functional) | <input type="checkbox"/> Executive, Product line (i.e. Cross-functional) |
| <input type="checkbox"/> Under 1 year (i.e. Short-term) | <input type="checkbox"/> Over 1 year (i.e. Long-term) |
| <input type="checkbox"/> Other _____ | |
82. Your name. *Optional.* _____

Questions 83 - 84 are short answer questions. Please respond to the following questions by providing a short answer response in the space provided.

83. Based on your experiences, what is the greatest challenge for a virtual team?
84. Based on your experiences, what is the greatest challenge for effective communication between team members of a virtual team?
-

Appendix B. Research participants

The companies and team descriptions for research participants are given in the following table.

Company ^a	Team description	Size	n ^b
Transnational consulting 1	Research and development of learning systems	8	7
Transnational consulting 2	Leadership team to support consulting practice	8	3
Transnational high tech 1	Technology product development and marketing	7	5
Transnational high tech 2	Internet commerce	4	3
US legal 1	Corporate restructuring and litigation support	3	3
US legal 2	Legal research and support	3	3
US agriculture (five teams)	Region 1 — sale of dairy products	8	7
	Region 2 — sale of dairy products	5	5
	Region 3 — sale of dairy products	15	14
	Region 4 — sale of dairy products	10	9
	Leadership team to support sales teams	5	5
Transnational consulting 3	Client project team	5	3

^a In order to maintain confidentiality for all company sponsors, as well as virtual team members, the real names of these companies and teams have not been used. The fictitious names contained herein are used for illustrative purposes only.

^b Number of team members who returned surveys and participated in the research study. Total response rate = 83%.

Appendix C. Research results

The profile of virtual team members and their virtual teams are illustrated in Table 12.

The Pearson correlations for US/national teams are shown in Table 13.

C.1. Summary of results/conclusions

- Effectiveness measures of performance (Eff-Pr) and satisfaction (Eff-St) — strong correlations;

confirms validity of both indicators actually measuring effectiveness.

- Team process (Procs) and team member relations (Reltns) — strongest correlations to both measures of effectiveness; confirms validity of overall results.
- Selection procedures (Slctn) and executive leadership style (SrLd) — next strongest (i.e. moderate) correlations to both measures of effectiveness; confirms validity of overall results.

The Pearson correlations for transnational teams are shown in Table 14.

Table 12
Profile of virtual team members and their virtual teams

Question	Response
Your position in the organization	64% — individual contributors; 9% — supervisors (i.e. managers, directors, vice presidents, senior executives)
Have you been a member of this team since its inception?	31% — no; 69% — yes
In the last year, how many virtual teams have you participated in?	6% — none; 53% — one or two teams; 41% — more than two teams
In the last year, how many co-located teams have you participated in?	66% — none; 24% — one or two teams; 13% — more than two teams
How long has this team been in existence?	49% — 6 months or less; 26% — 6 months to 1 year; 25% — more than 1 year
How would you describe this team — functional or cross-functional?	76% — functional (i.e. R&D, sales); 24% — cross-functional
How would you describe this team — short-term or long-term?	39% — short-term (under 1 year); 61% — long-term (over 1 year)

Table 13
Pearson correlations for US/national teams^a

	Com	Desgn	Educ	Eff-Pr	Eff-St	IntLd	Job	Procs	Reltns	Rwrdr	Slctn	SrLd	Tools
Com	1.00	0.44	0.45	0.38	0.37	0.44	0.37	0.43	0.21	0.20	0.44	0.35	0.28
Desgn	0.44	1.00	0.33	0.30	0.34	0.35	0.23	0.47	0.44	-0.02	0.46	0.37	0.20
Educ	0.45	0.33	1.00	0.50	0.44	0.55	0.49	0.45	0.20	0.61	0.37	0.62	0.60
Eff-Pr	0.38	0.30	0.50	1.00	0.73	0.49	0.32	0.61	0.61	0.42	0.52	0.58	0.41
Eff-St	0.37	0.34	0.44	0.73	1.00	0.49	0.23	0.65	0.71	0.52	0.54	0.48	0.42
IntLd	0.44	0.35	0.55	0.49	0.38	1.00	0.25	0.39	0.50	0.41	0.37	0.66	0.49
Job	0.37	0.23	0.49	0.32	0.23	0.25	1.00	0.29	0.08	0.35	0.23	0.26	0.20
Procs	0.43	0.47	0.45	0.61	0.65	0.39	0.29	1.00	0.62	0.47	0.45	0.39	0.25
Reltns	0.21	0.44	0.20	0.61	0.71	0.50	0.08	0.62	1.00	0.32	0.50	0.40	0.14
Rwrdr	0.20	-0.03	0.61	0.42	0.52	0.41	0.35	0.47	0.32	1.00	0.22	0.52	0.35
Slctn	0.44	0.46	0.37	0.52	0.54	0.37	0.23	0.45	0.50	0.22	1.00	0.48	0.42
SrLd	0.35	0.37	0.62	0.58	0.48	0.66	0.26	0.39	0.40	0.52	0.48	1.00	0.54
Tools	0.28	0.20	0.60	0.41	0.42	0.49	0.20	0.25	0.14	0.35	0.42	0.54	1.00

^a All scores in bold indicate significant correlations between variables. Scores in RED indicate correlations with Effectiveness measures; scores in BLUE indicate correlations to other predictor variables. Scores have been rounded up to two digits after the decimal point.

C.2. Summary of results/conclusions

- Effectiveness measures of performance (Eff-Pr) and satisfaction (Eff-St) — strong correlations; confirms validity of both indicators actually measuring effectiveness.
- Team process (Procs) and team member relations (Reltns) — strongest correlations to both measures of effectiveness but only strong relations indicated to performance or satisfaction, not both.
- Internal team leadership (IntLd) and communication patterns (Com) — next strongest (i.e. moderate) correlations to both measures of effectiveness but only strong relations indicated to performance or satisfaction, not both; results indicate a significant difference from the overall results and question the generalization of the overall results to the transnational teams.
- Selection procedures (Slctn) and executive leadership style (SrLd) — weaker correlations to both

Table 14
Pearson correlations for transnational teams^a

	Com	Desgn	Educ	Eff-Pr	Eff-St	IntLd	Job	Procs	Reltns	Rwrdr	Slctn	SrLd	Tools
Com	1.00	0.27	-0.07	0.53	0.22	0.23	-0.11	0.47	0.15	0.09	0.32	0.02	0.06
Desgn	0.27	1.00	0.30	0.15	0.21	0.51	0.34	0.38	0.51	0.41	0.39	0.11	0.29
Educ	-0.07	0.30	1.00	-0.09	-0.07	-0.18	-0.14	-0.28	0.05	0.71	-0.16	-0.10	0.26
Eff-Pr	0.53	0.15	-0.09	1.00	0.62	0.44	0.44	0.66	0.40	0.15	0.49	0.48	-0.18
Eff-St	0.22	0.21	-0.07	0.62	1.00	0.58	0.34	0.43	0.67	0.21	0.31	0.43	0.37
IntLd	0.23	0.51	-0.17	0.44	0.58	1.00	0.60	0.48	0.63	0.08	0.43	0.53	0.20
Job	-0.11	0.34	-0.14	0.44	0.34	0.60	1.00	0.41	0.29	0.10	0.62	0.41	0-.25
Procs	0.47	0.38	-0.28	0.66	0.43	0.48	0.41	1.00	0.61	0.07	0.61	0.42	-0.16
Reltns	0.15	0.51	0.05	0.40	0.67	0.63	0.29	0.61	1.00	0.37	0.28	0.55	0.25
Rwrdr	0.09	0.41	0.71	0.15	0.21	0.08	0.10	0.07	0.37	1.00	-0.18	0.24	0.29
Slctn	0.31	0.39	-0.16	0.49	0.31	0.43	0.62	0.61	0.28	-0.18	1.00	0.24	-0.25
SrLd	0.02	0.11	-0.10	0.48	0.43	0.53	0.41	0.42	0.55	0.24	0.06	1.00	0.09
Tools	0.06	0.29	0.26	-0.18	0.37	0.20	-0.25	-0.16	0.26	0.29	-0.25	0.09	1.00

^a All scores in bold indicate moderate–strong correlations. Scores in RED indicate correlations with effectiveness measures; scores in BLUE indicated correlations to other predictor variables. Scores have been rounded up to two digits after the decimal point.

Table 15
Mean scores for frequency of use to exchange business information^a

Tools	US teams (<i>n</i> = 46 cases)	Transnational teams (<i>n</i> = 21 cases)
E-mail	4.80	4.70
Personal telephone call	3.98	3.20
Voice mail	3.02	2.79
Fax	2.28	0.78
Standard/express mail delivery	2.24	1.00
Group telephone conference	2.15	1.50
Face-to-face interaction	1.94	1.50
Shared databases/groupware	1.73	2.33
Video conference	0.00	0.95
Other	0.00	1.57

^a Frequency values — 5: daily; 4: a few times a week; 3: once a week; 2: once a month; 1: less than once a month; 0: never/not applicable.

measures of effectiveness; results indicate a significant difference from the overall results and question the generalization of the overall results to the transnational teams.

The mean scores for frequency of use to exchange business information are illustrated in Table 15.

C.3. Summary of results/conclusions

- E-mail — most frequently used tool for ALL teams.
- Personal telephone call — second most frequently used tool for ALL teams; more prominent use by US/national teams, probably due to difference in time zones and possibly high associated costs for transnational calls.
- Voice mail — third most frequently used tool for ALL teams, probably as a direct result of personal telephone calls that are not connected (i.e. individuals unavailable to take phone calls); more prominent use by US/national teams.
- Fax and group telephone conference — more prominent use by US/national teams, probably due to difference in time zones and possibly high associated costs for transnational calls.
- Standard/express mail delivery and face-to-face interaction — more prominent use by US/national teams, probably due to difference in geographic distance and possibly high associated costs for transnational delivery/travel.
- Shared databases/groupware — more prominent use by transnational teams, probably due to inability to utilize other communication vehicles; may be

most efficient and cost-effective way to share business information due to difference in time zones and geographic distance.

- Video conference — although used less than once a month, more prominent use by transnational teams, probably due to inability to utilize other communication vehicles; may be a most efficient and cost-effective way to share business information with other team members through “simulated face-to-face interactions” due to difference in time zones and geographic distance (Note: video conference either never used by or not available to US/national teams (mean = 0.0)).
- Other — these tools represented either on-line data/voice chat technologies or other miscellaneous technology to exchange business information; more prominent use by transnational teams, probably due to inability to utilize other communication vehicles; may be perceived as a efficient and cost-effective way to share business information due to difference in time zones and geographic distance.

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