Virtual team interaction: assessment, consequences, and management

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Abstract

Virtual teams are typically made up of geographically dispersed experts, supported by computer-based communication technologies. Though increasingly popular this is still a relatively unstudied organizational form. Virtual team membership is typically based solely on needed expertise; the teams rarely have any history of interaction and their performance potential is unknown. Research shows that teams exhibit constructive, passive, and aggressive interaction styles, which have significant effects on the decisions the teams produce as well as the teams' satisfaction with those decisions. We present managerial tools for the assessment of conventional and virtual team interaction styles. We detail how the tools are used, and we also discuss how the styles manifest in each medium, and their effects. We give suggestions to team managers on how to use the insights the tools provide to manage their virtual teams for optimal performance.

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Introduction

The team work unit, groupware, and a hypercompetitive business environment have been the catalysts for new organizational forms – the virtual organization, and its smaller version, the virtual team (Jarvenpaa and Ives, 1994). Virtual team members are geographically and often temporally distributed, possibly anywhere within (and beyond) their parent organization. The team members possess relevant knowledge and need to collaborate to accomplish tasks. Typically, the members have different areas of expertise and often work in different functional areas (Lipnack and Stamps, 1997; Townsend *et al.*, 1998; Duarte and Snyder, 1999). The virtual team, via groupware, can interact and collaborate though separated by distance and time. This ability gives organizations increased flexibility and responsiveness, permitting them to rapidly form dispersed and disparate experts into a virtual team that can work on an urgent project. When finished, the team can be disbanded and members redeployed to other projects; members may also serve on multiple virtual teams simultaneously.

The virtual team (or *vteam*) remains an emerging and relatively unstudied organizational form. New organizational forms can present a myriad of managerial challenges, with ambiguous roles for its members, potentially high coordination costs, worker reassignment, undetermined performance standards and metrics, and accountability issues. Piccoli (1999) categorizes virtual team management issues as internal (e.g. identification of processes and characteristics of effective virtual teams), external (e.g. team boundaries, gatekeeping, external communication), technological (support systems), and societal (implications for individuals and society).

Our research and development focuses on internal and technological issues of virtual team management. We are particularly concerned with the assessment of interaction styles that virtual teams exhibit. As following sections will detail, these interaction styles play a major role in the processes and outcomes produced by conventional groups and by virtual teams. We then describe our popular conventional group interaction diagnostic tool and its new virtual counterpart. In its conventional form, the tool

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has proven very effective in diagnosing group interaction styles and aiding managers in predicting group effectiveness. Our recent research shows that the virtual version is equally effective for distributed teams linked via the World Wide Web. In the next section we will describe the literature on group interaction styles and the relationship of these interaction styles to group processes and performance outcomes.

Team interaction and performance

One of the major components of teamwork is communication (McIntyre *et al.*, 1989; Morgan *et al.*, 1986). According to Dickinson and McIntyre (1997), communication involves the exchange of information between two or more team members in the appropriate manner. It also serves to clarify, verify, and acknowledge messages. Communication is central to teamwork because it links together other components such as monitoring of performance and feedback.

While critical to effective teamwork, communication can also be inherently difficult. Members of problem-solving teams face two types of pressures in achieving quality solutions and high solution acceptance (Maier, 1963, 1967). On the one hand, there is pressure on each member to contribute unique, and possibly controversial, information to maximize the team's resources (Hoffman, 1979). On the other hand, members of teams tend to believe that closure to team problem solving and strong solution acceptance are best achieved through conformity of opinions (e.g. Festinger, 1950; Hoffman, 1979; McGrath, 1984).

The way in which a team deals with the conflicting "task" and "maintenance" pressures is reflected in the team's interaction style. A study by Watson and Michaelsen (1988) showed that a team's interaction style can affect performance. They identified positive and negative behaviors as components of group interaction style. Three groups of behaviors (expectations of performance and integration, leadership, and cohesiveness) contributed to team performance on an intellective task while one group of negative behaviors (e.g. noninvolvement, withholding of information) detracted.

Building on the Watson and Michaelsen typology and others (Maier, 1967; Hoffman, 1979), Cooke and Szumal (1994) suggest that group interaction can be analyzed in terms of three general styles: constructive, passive, and aggressive. The constructive style is characterized by a balanced concern for personal and group outcomes, cooperation, creativity, free exchange of information, and respect for others' perspectives. The constructive style enables group members to fulfill both needs for personal achievement as well as needs for affiliation. The passive style places greater emphasis on fulfillment of affiliation goals only, maintaining harmony in the group, and limiting information sharing, questioning and impartiality. The aggressive style places greater emphasis on personal achievement needs, with personal ambitions placed above concern for group outcome. Aggressive groups are characterized by competition, criticism, interruptions, and overt impatience.

Groups whose interactions are characterized by a dominant style (constructive, passive, or aggressive) achieve different levels and patterns of effectiveness. Specifically, predominantly constructive groups produce solutions that are superior in quality to those produced by passive groups and superior in acceptance to those produced by either passive or aggressive groups. Groups with predominantly passive styles produce solutions that are inferior in quality to those of constructive (and possibly aggressive) groups and inferior in acceptance to those of constructive groups. Similarly, groups with predominantly aggressive styles produce solutions that are not as consistently of high quality as those generated by constructive groups but not as consistently of low quality as those produced by passive groups. The solutions produced by aggressive groups generate less overall acceptance than those developed by constructive groups and about the same level of acceptance as those generated by passive groups (Cooke and Szumal, 1994).

Group interaction styles are theorized to affect performance because they can impede or enhance team members' ability to bring their unique knowledge and skills to bear on the task, and the extent to which they develop and consider alternative strategies for approaching the task (Hackman and Morris, 1975). This is particularly critical for groups

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with heterogeneous levels of expertise, as communication by most expert group members is positively correlated with group performance. Zalesny (1990) found that the most accurate member in interacting groups did not influence performance unless he or she was assertive and confident. Bottger (1984) also found that amount of communication time and expertise were positively correlated with performance, though only with high-performing groups. In their study of estimation methods for individual/team performance differences, Cooke and Kernaghan (1987) found that average individual scores explain an average of 57 per cent of the variance in team scores. They also noted that the expertise of the best member contributes significantly to the team score, above and beyond the average individual score, with both factors together explaining an average 69 per cent of the variance in team score performance. That study also documented significant variances in relative performance, with some groups composed of less able individuals showing significant group process gains, and instances of high-potential groups (i.e. with high average individual performance scores) showing minimal gains or even losses due to group processes. Group performance has usually been found to be inferior to that of the best individual, and typically, groups perform better than the average of their individual members and worse than their best individual member (Burleson *et al.,* 1984; Hill, 1982; Libby *et al.,* 1987; Yetton and Bottger, 1982).

In addition, group interaction style can affect performance differently over time. In a study of interacting groups working on an intellective task for four months, Watson and Michaelsen (1988) found that group characteristics of greater focus on performance and integration of individual differences were predictive of higher performance (compared to groups focused on member expression and input) in the early stages of the group's existence and less predictive in later stages.

In general, then, group interaction styles affect communication and thus team performance by facilitating or hindering the exchange of information among group members. The effects are more pronounced as the interaction style suppresses or facilitates communication from the most expert group or team members. The instrument that we detail later in this paper can accurately assess FTF team interaction styles, and is useful in predicting team performance. It is a popular tool for organizational consultants and managers whose teams are having problems, as well as for predicting how potential team lineups are going to interact and perform. Our recent evaluation of its virtual counterpart has shown it to be equally effective. Although we do not describe that research here, this accomplishment is neither trivial nor presumed, for as Hollenbeck *et al.* (1997) state, "The degree to which research on face-to-face interactions – that are rich in information redundancy, plus verbal and nonverbal feedback – will generalize to more confined technological media is an open question."

The Group Styles Inventory

The Group Styles Inventory (GSI) was developed to measure group interaction styles that (as noted above) are theoretically linked to the quality and acceptance of group solutions (Cooke and Lafferty, 1988). The GSI is a self-report survey made up of 72 statements regarding the behaviors of members, the atmosphere of the problem-solving session, and the impact of the group on the behavior of individual members. The items assess the three distinct, yet interrelated, group styles – constructive, passive, and aggressive. Each member's scores along each of the three GSI styles are calculated by adding his or her responses to the 24 items composing each of the respective scales. The items describe specific collective behaviors that might characterize a group to a very great extent (response option 5) or, at the other extreme, not at all (response option 1). Cronbach alpha coefficients can be calculated of each style measure to determine response consistency (measures of 0.80 and above are typical). Cooke and Szumal (1994) offer a detailed explanation of the GSI's theoretical foundations and a demonstration of its ability to accurately assess interaction styles and link them to group performance.

The GSI is often used after a team decision-making or problem-solving task, such as a survival or business situation simulation. The tool gives participants an organized, reliable method for evaluating how well the group

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performed together. It also gives the group members insight into factors explaining the group's performance, including their individual interaction styles with regard to decision making, problem solving, and relating to one another. By using the instrument to develop shared perceptions of the group's (and its individual members') functioning during the problem-solving process, the group can determine what it needs to do to make the group process more effective. Used in combination with a decision/problem-solving task, the tools give teams a means for measuring and monitoring team performance, for developing a creative and open team culture, for improving analytical skills, consensus problem-solving and decision-making skills, and ultimately improving team synergy and performance (Human Synergistics, 1987, 1993, 1994). The tools also give managers insight into the performance potential of various team configurations.

The GSI for virtual teams

The virtual team version of the GSI (Balthazard, 1999a) and the desert survival task (Balthazard, 1999b) are available on the Internet for participants to access using standard browsers. Pre- and post-task questionnaires, including the GSI were developed using survey Webbots in Microsoft Front Page '98 that produce comma delimited text files of responses for eventual processing in a spreadsheet or a standard statistical package. Web-based textual description of the desert survival task is enhanced by links to digitized streaming video clips available on demand. Group communication is accomplished using an Active Server Page (ASP) threaded-discussion system that allows team members to post new threads, reply to current messages, or search the team's written record of the discussion. Messages are posted using a "most recent at the top" method with replies creating clear hierarchies under each thread. In the Web interface, the left-hand side window displays a scrollable roadmap of the discussion – indicating for each contribution a subject label, the name of the contributor, and date/time of the contribution. The right-hand window is used for participants to read selected messages (by clicking in the left-hand window) or to create their own contribution. Teams are given access to their own private (password protected) Web discussion.

Although the system supports semi-synchronous written communication, the interface is significantly different than that of a chat room: it essentially provides more structure to the discussion and the possibility of multiple and non-sequential sub-discussions. The system retains group discussions in textual format for secondary analysis.

Using the Vteam GSI and survival task

Initially, users are introduced to the technology and the general purpose of the exercise. If a number of teams wish to participate, members are assigned to a virtual team and asked to provide a team name and select a team secretary (a participant with the responsibility of providing the group consensus solution for the problem with no implied leadership role). As individuals (with no interaction yet permitted), they are provided with the URL of the home page for the simulation and asked to complete/submit a pre-task "registration" questionnaire requesting biographical type information (name, team name, age, gender, education, and previous experience with technology).

Team members are then directed to peruse a different Web page that describes the decision task. The desert survival simulation places teams in a desolate region of the Sonoran Desert in the middle of summer (where their chartered plane has crashed) and challenges them to correctly rank 15 items they have salvaged in order of their importance to the team's survival. To further understanding, participants also view a five-minute digitized video stream of the situation. *The Desert Survival* video is frequently used by consultants and trainers carrying out the exercise with FTF groups. Before entering into a group discussion, each participant ranks the 15 items on an individual basis and submits their personal solution for processing by the Web system. Szumal (1999) describes this type of problem as a content-free simulation that is likely outside the sphere of expertise within the group but designed to direct attention to overall team problem-solving processes and skills. The Web pages containing task information and the video

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stream are made available for the duration of the simulation.

Each team is then given the URL of a password protected threaded discussion Web and given a period of time to interact (exclusively using the threaded discussion) to produce a group solution on a consensus basis. In our development, we used seven days; more or less time may be substituted. Team members can access the discussion Web from any location (with a computer, browser, and Internet connection) and at any time. Team leaders do not need to be formally designated and, therefore, any leadership roles assumed by members can emerge informally. Upon achieving a consensus solution, the virtual team's secretary submits the consensus group ranking and each member independently completes a group process questionnaire (assessing efficiency, effectiveness, and buy-in) and the GSI instrument (Cooke and Lafferty, 1988; Balthazard 1999b). The group process questionnaire and the GSI are both answered after ranking the items as a group but before receiving feedback on the "experts' ranks" or the quality of their own solution.

The information submitted via the Vteam GSI can be instantly analyzed to create graphics based on the circumflex design that clearly show a team's dominant interaction style. The analysis also yields performance information including the quality of the solution (as compared to the expert solution), and acceptance of the final solution by the team members. The analysis also reveals other important results that give further insight into the team's interaction. These are measures of best individual team member's solution, and the gain (or loss) over this solution by the consensus solution developed by the team.

How to apply what you learn about your VTeam

Together these graphics and other results give a very clear picture of the quality of interaction in the team. Our findings, like those of previous research, show that interaction styles derive from the stable and enduring personality and behavioral characteristics of individual team members. We also have extensive evidence that the computer-based communication medium does not substantially diminish these characteristics, their expression, or the ability of other team members to perceive them. The effects of the interaction styles have very similar effects to face-to-face teams on the virtual teams' solution quality and acceptance. These findings provide the bases for some useful suggestions for virtual team managers.

First, when possible, select team members who exhibit constructive behaviors. Recent studies examining leadership and group performance suggest that many leader characteristics are consistent with constructive behaviors (Taggar *et al.*, 1999; Strauss *et al.*, 1999; Weisband and Atwater, 1999). Second, when teams cannot be composed of only constructive individuals, educate members on the constitution and effects of the styles. Another strategy is to embed into the communication programs (e.g. a Lotus Notes/Domino-based team discussion format) cues to promote active participation, thoughtful consideration of ideas, and other prompts that would suppress negative interaction behaviors and encourage positive ones. We have occasionally noticed a rather rapid evolution of dominant interaction styles in certain teams; that suggests that team interventions should be implemented at the early stages of the team's development to redirect passive/defensive and aggressive/defensive tendencies and promote a more constructive interaction style.

Third, team managers need to be aware that although the interaction styles manifest in the same way and cause results in the same way in the on-line environment as with face-to-face teams, those results are often exaggerated beyond what is typically seen in the conventional setting. Specifically, constructive styles are still the most conducive to high team performance in either format. However, passive/defensive virtual teams tend to perform significantly worse than their FTF counterparts. This is because in the virtual world, passivity is usually non-response, or at least limited participation. Part of the characteristics of the constructive interaction style in the face-to-face team is to enjoin passive members to participate, either verbally, or with other communication cues. These other communication cues (such as expressions and gestures) cannot exist in the virtual domain. Passive members can more easily ignore their other team members, and

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therefore, it is more difficult to reverse or moderate passivity in the virtual environment.

On the plus side, aggressive/defensive interaction styles do less damage in the virtual world. In conventional teams, this style is often manifest as a monopolization of the discussion, limiting input from other team members. With the technology used for virtual teams, however, all team members can participate and contribute their knowledge and opinions simultaneously, and do not have to wait for a potentially dominating member to stop speaking.

Conclusion

In many organizations, virtual teams are the most expedient way to bring distributed and complementary expertise to bear on a problem. But as with conventional teams, it is unrealistic to assume that shared goals ensure the constructive communication necessary for superior and timely accomplishment. Virtual teams are often assembled of experts who may have no shared history of collaboration, formed into a team simply because they have the right knowledge. Managers and virtual team members must typically deal with a number of issues that come with this work unit, including training and proficiency with the support technologies, potential cultural and organizational differences, and goal sharing. Even if these extrinsic factors can be dealt with, the basic factor of team interaction remains. Most people have witnessed experts with interaction styles that tend to suppress valuable input from would-be contributors. The interaction style that the team will exhibit is thus unknown to the manager, as is their performance potential. Using the tools described here, managers can now proactively assess and manage these groups for optimal performance.

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