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ABSTRACT

Organizations depend on teams for their success, and as information technology (IT) capabilities have improved they have increased their use of virtual teams. Virtual teams allow organizations to dynamically adjust to changing needs, but present unique leadership challenges. There is currently little theory on how leadership works in virtual teams and few studies that provide empirical evidence for the ideas that have been advanced. This study reports results gleaned from a two-week collaboration project undertaken by a large team using an array of IT capabilities in a distributed virtual environment. It found support for key ideas espoused in models of shared leadership and captures lessons that could be useful to practitioners.

Keywords

Leadership, virtual teams, virtual collaboration.

INTRODUCTION

Organizations depend on teams for their success, and as IT capabilities have improved they have increasingly turned to virtual teams to draw on expertise for these teams (Bell and Kozlowski, 2002). Virtual teams are defined as *teams that rely on the information technology capabilities to address their collaboration needs across boundaries* (Powell, Piccoli and Ives, 2004). Several issues affect leadership in virtual teams, such as establishing a leader's presence, working with advanced technologies, and adapting team processes (Zigurs, 2003). Extant research on team leadership has not yet rigorously addressed these leadership issues and has tended to rely on traditional models that emphasize leader-subordinate relationships rather than leader-team relationships (Morgeson, DeRue and Karam, 2009). As such, there is little theory to guide research on leadership in virtual teams and few studies that provide empirical evidence of the theoretical notions that have been advanced (Bell et al., 2002; Morgeson et al., 2009)

This study reports results from a two-week project by a large team using an array of IT capabilities in a distributed virtual environment. Specifically, this study examines leadership behaviors that occurred to assess how well those behaviors align with propositions that have been advanced in various conceptual papers. The goal of this study is to point the way to more robust theory that explains leadership behaviors in a virtual distributed environment while also providing recommendations of more immediate value to practitioners.

The organization of the paper is as follows. First, we discuss propositions that have been advanced to explain leadership in virtual teams. Then we describe the design and instrumentation of a study that we believe illuminates the mechanisms of virtual team leadership. We follow that description by describing the team's activities and outcomes, and then close with a discussion of possible implications of those results.

THEORETICAL BACKGROUND

Scholars seem to agree that virtual teams allow organizations to dynamically adjust to changing needs, such as assigning team members for fast-breaking, short-term assignments based on personnel availability or a need for specific expertise (Powell et al., 2004). These dynamic team assignments can result in team membership that spans great distances, crosses organizational boundaries, or separates members along any of a wide variety of other dimensions such as differences in culture, training, or experience (Pinsonneault and Caya, 2005; Zigurs, 2003). Regardless of how team members are separated or which specific technologies they use to span those separations, their goal is to work together (McGrath, 1984).

McGrath describes team interactions as patterned relations among team members focused on achieving team goals (1991). These interactions follow a rhythm of action and transition phases that varies as teams cycle through their assigned tasks (Marks, Mathieu and Zaccaro, 2001). During action phases, team members analyze data, draft documents, coordinate

products, and other activities that directly contribute to task assignments. In transition phases, team members assess their performance, adjust based on results, and plan for how they will accomplish future tasks. Throughout the team's life-cycle interpersonal processes will also occur as team members resolve differences, motivate each other, and share the team experience (Morgeson et al., 2009).

As teams move through recurring action, transition, and interpersonal cycles, it is common for different people to have the key abilities necessary to best meet the team's needs at different points in time (Carson, Tesluk and Marrone, 2007). This can be especially applicable in virtual teams that depend on general management abilities, interpersonal skills, core skills relevant to the team's task (e.g., defense analysis), plus strong technical abilities (Yoo and Alavi, 2004). While some individuals may be able to address this full range of needs, teams can be better served by allowing the person most capable of satisfying the team's most pressing need to lead at that time (Morgeson et al., 2009). This person may not be the formally appointed leader, but plays an important role in shaping the team's dynamics and outcomes (Pearce and Sims Jr., 2002).

In sum, virtual teams are an increasingly common option for organizations that need to spread scarce, dispersed talent across projects. These teams face challenges that can be more demanding than those faced by traditional teams and so may benefit from the use of different leadership models to overcome those challenges. This study examined the question the "*Do virtual team interactions reflect different activity phases, and if so, do different leaders emerge as teams shift through these phases*?"

RESEARCH DESIGN

The study ran for two weeks, with the participants working together in four 2-hour sessions in each week. On the first day of each week the participants were trained on how to use the technologies that would be available for that week. In Week 1 the participants were given email, Voice over Internet Protocol phone, and file sharing capabilities. In Week 2, instant message (IM) and desktop video teleconferencing (VTC) capabilities were added. While each technology has its own unique characteristics, within the context of this experiment they are considered as alternative means of communication. The participants were told that they were free to choose 1) which of the available collaboration capabilities they wanted to use and how, 2) how they would conduct their analysis, 3) how they would reach consensus, and 4) the degree to which they share information with other participants.

Task

The participants analyzed a large set of overlapping, and in some cases conflicting, data to develop a report that synthesized the data they were given into a sensible storyline. A report that reflected the group's consensus of what the storyline should be based on the available data was due at the end of each week. The participants were prompted with a total of 141 inputs spread across the 8 days of the study. Those inputs were given to the participants through the various technologies that were available. Some inputs pertained to the main storyline, some could seem plausible but did not pertain to the main storyline, and some were outright distracters. The graphs in Figure 1 illustrate the proportions of inputs by type and distribution method.
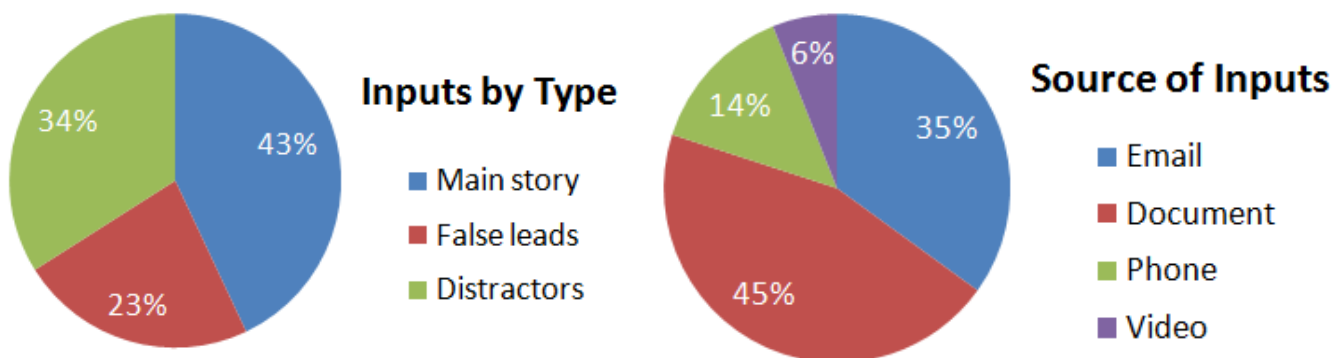

Figure 1: Characterization of Information Provided to Participants

Participants

Twenty volunteer "analysts" from across the continental US were placed into four subgroups that ranged in size from 3 to 7 members. Three subgroups were physically collocated (sizes of 5, 5, and 3 respectively). The final subgroup had 2 collocated members with the rest operating solo. Figure 2 depicts the participants' locations. No one was designated as leader of the overall group or for any of the subgroups.

Figure 2: Participant Locations

Data Collection

The participants were asked at the end of each day to identify participants that they felt exhibited leadership and to describe the specific behaviors that led them to that conclusion. While not every participant was available for each day of the experiment, all who participated did provide data daily. To triangulate these self-reported perceptions, we also collected technical system data associated with the use of the various collaboration tools (e.g., copies of emails), observed group interactions, and interviewed participants.

Analysis Plan

The content from those emails, surveys, and researcher observations were analyzed post-hoc to identify action and transition activities. Following the taxonomy outlined by Marks et al (2001), messages/dialogues that related to allocating tasks or resources, setting team goals, or ways to organize team activities were labeled as "Transition" activities. Specific task-related messages/dialogues were labeled as "Action" activities. This analysis supported a comparison of the ratios of communication in each category as the team moved through its tasks. Additionally, messages/dialogue that specifically discussed leadership activities were grouped by day to support more in-depth analysis of leadership behaviors over time.

RESULTS AND ANALYSIS

As observed by the study's authors, a distinct pattern of interactions emerged as the participants worked together. Participants started each week by analyzing and exchanging clues to develop theories. As their analyses took shape, 2-4 participants would discuss competing theories and refine ideas for presentation to the entire team. Toward the end of the week, they all came together to synthesize the small group theories into one cohesive storyline. This rhythm of individual analysis, small group discussions, and synthesis repeated in the second week.

Email content analysis confirms this overall pattern. Emails were classified as either action phase or transition phase activities and daily counts for each category were plotted against each other; socially-oriented emails were disregarded in this analysis (see Figure 3).
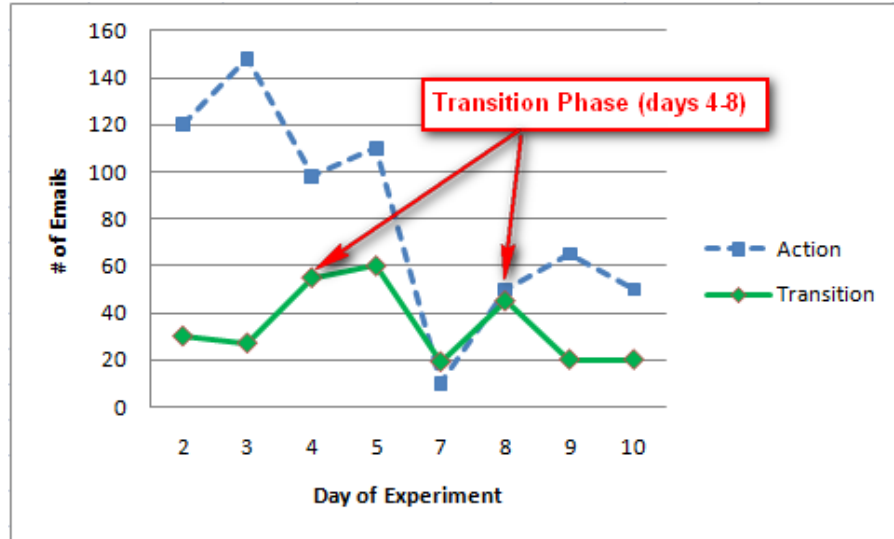
Figure 3: Email Use

The graph shows action phase email traffic was high days 1 and 2 as participants shared clues and ideas; the totals for were even higher as participants also shared their expertise and research interests. On Day 4, transition phase email traffic rose as participants considered the quality of their analysis, decided how they would prepare the report, and worked on process improvements. The uptick in action-oriented email traffic on Day 5 seemed related to circulating ideas for the week's summary report.

Day 7 saw a precipitous drop in all email. The IM and VTC capabilities were introduced at the start of Week 2, so we likely would have seen a drop with the opening of these new communications channels anyway. However, the desktop VTC training did not go smoothly, and most participants were not capable of using it. This problem triggered the emergence of new leaders who were capable of addressing technical issues. Specifically, a few participants who could use the system spent most of Day 7 leading a general VTC session to familiarize others with the system and develop processes to use the new tools. For example, participants reorganized themselves to form "thread teams" that followed specific aspects of the story. The following comments identified specific leadership behaviors:

- *Organized meetings and worked through VTC issues (mentioned 3 times)*
- *Called each group to create a protocol to deal with all the collaboration tools*
- *Great suggestions for rules and methodologies for sharing information within collaborative workspaces*
- *Implemented idea to shift to thread-based teams*

There were other examples of how leadership shifted within and across these phases. In Week 1, one participant created a log of every clue and categorized all of them. She quickly became her subgroup's analysis expert. In one of her team's meetings it was observed that people would propose theories, and the entire team would look to her for confirmation. Only after she indicated approval would the team commit further resources to investigating that potential storyline. Another participant produced what came to be called a "connections map." His drawing listed every clue and linked them to the potential threads. He too came to be recognized as an analysis expert and led sub-group analysis discussions. Comments made on the daily surveys recognized their leadership:

- *Took initiative to lay out the facts for the teams*
- *Established a data collection format*
- *Good compiling to get the ball rolling* [with threat analysis]
- *Presentation of good analytical summaries*

When it came to report preparation, people who helped to apportion tasks and organize activities were recognized as leaders, as the following comments indicate:

- *Coordinated efforts with the group for providing input to the whole community*
- *Initiated a conference call to coordinate the team*

- *Helped with organization, taskers, and working through numerous issues that arose*
- *Helped delegate areas of responsibility and point of contacts*

Another incident that emphasized the importance of having someone who could resolve conflict occurred on Day 4. One participant sent a casually-phrased email directing others to limit the number of "speculative" emails. Another participant reacted strongly to what he saw as the "unprofessional" tone of the email and chastised the sender. Through a variety of mechanisms, practically all of the other participants became aware of the exchange. It became the primary conversation topic among the participants that were observed that day and was also mentioned in that day's interview. In almost every case, the comments indicated that the incident had a stifling effect on the open exchange of information (note drop in day 4's email volume in Figure 3). Another participant subsequently sent several emails and made phone calls to smooth over this incident, and the participants seemed to recover on Day 5. This event demonstrated how deleterious conflict can be, and the way it was handled showed the value of leadership on the part of the person who worked to smooth it over.

CONCLUSION

In this study, different people emerged (and re-emerged) as leaders throughout the task's life cycle. The core task was analysis, and the people who seemed most adept at analysis were recognized as leaders when this was the team's key focus. At other times, the team needed technical expertise, and people with the right skills led them to resolve the technical issues. Others proved more capable at organizing, and their leadership was likewise recognized when those skills were needed most. What is particularly interesting in this study is the fact that these shifts occurred without the intervention of an external coach as had been the case in previous studies (e.g., Carson et al., 2007). As such, this study provides empirical support for conceptual papers that have been advanced to explain shared leadership.

Managers of people working in virtual environments should also be aware of this shifting pattern of leadership and think carefully about how they assign leadership in those environments. Nominative leaders of virtual projects should be comfortable sharing that leadership role. Another approach could be to simply allow the team to self-organize, the approach used successfully in this experiment. Regardless of the approach, being aware of this phenomenon and taking proactive steps to prepare the participants for it could help avoid potential tensions or even outright conflict, which has been shown to negatively impact performance.

Future Research

There is not currently a rich collection of validated measures of shared leadership. This study took a mixed-methods approach, triangulating on the phenomenon by integrating multiple qualitative techniques with corresponding quantitative measures. The field could benefit from simpler, more concise measurements. It could also be worthwhile to examine the efficacy of the shared leadership model under other circumstances. For example, it is possible that the degree of task complexity or the maturity of the team participants could influence the model's utility. And finally, it could also be useful to more precisely assess the degree to which the use of a shared leadership approach affects the quality of team results. This study used a simple pass/fail criterion, which is not necessarily reflective of many business scenarios.

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