Emergent Leadership in Self-Managed Virtual Teams

A Longitudinal Study of Concentrated and Shared Leadership Behaviors

TRACI A. CARTE, LAKU CHIDAMBARAM AND AARON BECKER
Price College of Business, Division of MIS, University of Oklahoma, Norman, OK 73019, USA
(E-mails: tcarte@ou.edu; laku@ou.edu; guitarist@ou.edu)

Abstract

The issue of leadership in virtual teams is an increasingly important one for many modern organizations, because these teams – typically project-based with a finite lifespan and specific deliverables – are frequently self-managed, having no designated leader within the team (Yukl 1998). While such teams may have increased flexibility in setting goals and achieving them, the virtual context may hinder team members’ abilities to coordinate activities and influence others (Manz and Sims 1993). Longitudinal data were collected over the course of a semester from virtual teams, comprised of students from three North American universities. Our results suggest that high performing self-managed virtual teams displayed significantly more leadership behaviors over time compared to their low performing counterparts. Specifically, these teams displayed significantly more concentrated leadership behavior focused on performance (i.e. “Producer” behavior) and shared leadership behavior focused on keeping track of group work (i.e. “Monitor” behavior) than the lower performing teams. Interestingly, these behaviors emerged strongly during the first half of the groups’ lifespan, and stayed throughout the life of the groups, but steadily dissipated in strength over time.

Key words: leadership, team performance, longitudinal study, virtual teams

1. Introduction

With the advent of new technology-enabled organizational forms, firms are increasingly relying on virtual teams to accomplish organizational objectives. Leading such teams can be particularly challenging, and much of the existing literature on team leadership does not translate directly to the leadership context of virtual teams (Hooijberg, Hunt, and Dodge 1997). Recent work on virtual teams suggests that leadership, in this electronic context, might be better viewed as a collective effort distributed among team members characterized by the sharing and rotating of leadership roles (Zigurs 2003; Avolio 1999). As such, existing work on self-managed teams seems particularly salient. Self-managed work teams are characterized by members taking responsibility for the quality of the work process and product as well as sharing in the management and/or leadership functions of the team (O’Connell, Doverspike and Cober 2002) – factors not uncommon in virtual work contexts where team members and leaders are separated by time and place.

Although the study of leadership in a self-managed team may seem contradictory, these teams typically retain some form of external supervision (Stewart and Manz 1995) and
studies of leadership in self-managed teams often focus on the role of this external leader (c.f., O’Connell et al. 2002). In such teams an external leader may be accountable for the team’s performance, but often does not get involved in the operational activities and day-to-day decision making of the team (Wageman 2001). Within self-managed teams, often there is a reliance on a member or members to step forward and informally carry out leadership functions within the team. Reliance on a leader who emerges informally is often deemed appropriate for two reasons (1) it is possible that the natural selection process will result in the most qualified member assuming leadership responsibilities and (2) it is believed the persons actually doing the work (i.e. the team members) are in the best position to determine who should take various role responsibilities (Erez, Lepine, and Elms 2002). Empirical evidence supports the notion that team members of virtual teams do engage in emergent leadership behaviors (Yoo and Alavi 2004) similar to self-managed teams.

In this study, we focus on the leadership behaviors in self-managed virtual teams enacted by the team members themselves – an area not addressed adequately in the literature. Specifically, we address the following questions: Are emergent leadership behaviors related to virtual team performance? Which behaviors are most beneficial and when? The teams in this study completed a project that included four phases. No leaders were assigned; however external leadership was provided by the course instructors. The deliverables in each phase built on the output of previous phases. We analyze the leadership behavior – performance link within each phase of the project, consistent with previous work that examined interaction processes in both initial and subsequent stages (Jarvenpaa and Leidner 1999). We seek to improve on previous findings by utilizing a longitudinal design and a realistic team-based task. Further, rather than focus on how/why leaders emerge, we seek to provide insights into whether/how emergent leadership impacts team performance.

2. Background

Virtual teams are a collection of individuals who are dispersed (geographically, organizationally, or otherwise), and who collaborate using information technology in order to accomplish a specific goal (Zigurs 2003). Often conceived of as a contrast to face-to-face teams, more recently researchers have turned to a definition that allows for degrees of “virtualness” on a continuum (Griffith, Sawyer, and Neale 2003). In the context of the purely virtual team, researchers have often suggested these teams are autonomous or lack a formal leader (c.f. Balthazard et al. 2004). However assigned leader or not, leadership behaviors are necessary in order to move the team forward (Zigurs 2003). Leadership mediated by technology, while likely focused on the same performance and relationship enhancing outcomes, may take a different form due to changes in the availability of information, dispersion of the team, and permanence of the communications (Avolio and Kahai 2003; Avolio, Kahai, and Dodge 2001). Further, there are features of collaborative technology that may substitute for traditional leadership skills. For example, anonymity may substitute for the transformational leader’s effect on promoting flexibility in thinking (Avolio and Kahai 2003).
EMERGENT LEADERSHIP IN VIRTUAL TEAMS

Leadership represents an important element for groups – one necessary for directing behaviors in pursuit of common goals (Hoyt and Blascovich 2003). As leadership researchers have sought to understand leadership in the new virtual team context, a new term has emerged, e-leadership – defined as a social influence process mediated by technology to produce a change in group attitudes, feelings, thinking, behaviors, and/or performance (Avolio et al. 2001). E-leadership may come from any hierarchical level, be associated with an individual or shared by a group, and its locus may change over time – consistent with characterizations of emergent leadership behaviors among members of self-managed teams.

Studies of leadership effectiveness in self-managed teams have often focused on the formal leadership, i.e. external leadership. For example, drawing on Bandura’s social learning theory (1977), self-leadership theory (Manz 1986) focuses on the influence behaviors external supervisors may exert on self-managed teams to facilitate self-regulating behaviors believed necessary for team success. However, recent work (Cohen, Ledford, and Spreitzer 1996) found no relationship between these supervisory behaviors and self-managed team effectiveness. These same researchers found team member involvement to be the strongest predictor of team performance suggesting that a more internal focus on member behaviors rather than on external leadership, may provide insight into effectively facilitating self-managed team processes.

Motivated by these findings, we develop hypotheses about the emergent leadership behaviors engaged in by self-managed team members and their impact on team outcomes. We build support for our hypotheses by drawing from traditional leadership literature as well as theories of team and emergent leadership. “Team leadership” focuses on the behaviors engaged in by group members rather than the behavior of a single, pre-ordained individual. Research in this area suggests that behaviors that guide, structure, or facilitate the group may be performed by more than one individual, and different individuals may perform the same leadership behaviors at different times (Zhang, Fjermestad, and Tremaine 2005; Sivasubramaniam et al. 2002). Further, applying an emergent leadership lens, it could be expected that virtual/self-managed teams engage in emergent leadership behaviors best characterized as task leadership (Bormann 1990) shared between members in either a delegated, co-leader, or peer fashion (Brown and Gioia 2002; House and Aditya 1997).

3. Literature Review and Hypotheses

Implicit in most studies of leadership is the belief that effective leadership is positively associated with better team outcomes. Behavioral theories of leadership have produced modest results identifying linkages between leadership behavior and performance (c.f., Kolb 1993). As different studies produced equivocal findings in terms of the leadership-performance link, researchers sought to identify moderator variables to explain when effective leadership might (or might not) produce the desired results (Howell, Dorfman, and Kerr 1986). Others have focused on perceptual aspects of leadership (Yukl 1998). While there is probably a strong correlation between leader behaviors and perceptions of leader effectiveness, the linkage is likely mediated by other important variables (Nygren and Levine 1996).
Another potentially fruitful research stream focuses on the link between communication behaviors of leaders and team outcomes (c.f., Klaus and Bass 1981). In fact, various communication behaviors are often included in measures of leadership (Bass 1990). This focus may be particularly salient for studies of virtual teams. While leadership in the more traditional face-to-face context may emerge using a variety of mechanisms, in the virtual context it likely relies largely on the communication effectiveness of the leader. Barge and Hirokawa (1989) propose “communication competency” as an alternative conceptualization of leadership. Specifically, they argue that possessing the skills to produce and sequence messages which facilitate the group’s ability to deal with existing barriers and problems enables one to exercise leadership in a group. Research findings about emergent leadership provide some support for this idea. Emergent leaders often are heavy contributors to the communication taking place in their groups – initiating more ideas, expressing more opinions, and asking more questions (Bass 1990).

Given the distributed nature of the virtual team environment and the limited potential impact of the externally imposed leader, we suggest that higher performing teams will rely more heavily on their internal communication competency. As such, their communication will include a higher incidence of emergent leadership behavior. Thus, we propose:

H1: The communication exchanges among high-performing teams will be characterized by a greater number of actual leadership behaviors compared to low-performing teams.

3.1. Specific leadership behaviors and the leaderplex model

While there is some consistency in the published work that leadership behavior is related to team performance there is little consistency in the behavior(s) studied. While a number of researchers have attempted to define a set of behaviors or portfolio of roles characterizing leadership behavior (Mintzberg 1973; Yukl 1998; Bass 1990), often the behaviors were conceived as being the opposite of or in contradiction to each other (Dennison, Hooijberg and Quinn 1995). However, the behavioral complexity view of leadership argues that effective leadership often requires the performance of multiple (and sometimes competing) roles simultaneously (Dennison et al. 1995). Hence, this view attempts to define a portfolio of roles and behaviors in which a leader engages in response to the complex demands of his/her environment.

In order to understand the complex nature of leadership in a virtual/self-managed team environment, we apply the leaderplex framework (Denison et al. 1995; Quinn 1984) (see Figure 1), which consists of eight different roles: Innovator, Broker, Producer, Director, Coordinator, Monitor, Facilitator and Mentor. This portfolio of behaviors can be distilled into four quadrants which loosely map to the three common theories of leadership – transformational, directive, and participative (see Table 1).

Given their focus on flexibility and external factors, the roles in Quadrant I equate well with Burns’ (1978) description of transformational leadership as that which inspires commitment and sacrifice for the group in each follower by seeking to understand that person’s motivation and using that to engage “the full person of the follower”. Quinn (1984)
himself described the leadership style in this quadrant as inventive, risk-taking, dynamic and competitive. On the other hand, the shared focus on stability of Quadrants II and III relates strongly to the motivation of a directive leader to mesh the internal actions of the team with external requirements in order to solve the problem at hand (Kahai, Sosik, and Avolio 2004). Quinn (1984) described Quadrant II as directive and goal oriented, and Quadrant III as conservative and cautious, consistent with current conceptualizations of
directive leadership (c.f., Kahai et al. 2004; Cruz, Henningsen, and Smith 1999). Finally, the roles in Quadrant IV are defined by their inward-looking focus on flexibility. Quinn (1984) labeled behaviors related to these roles as concerned and supportive. This focus is similar to the objectives of a participative leader, who is primarily concerned with actively engaging each member of the team in the task at hand through methods such as shared problem-solving and the equalization of power within the team (Kahai et al. 2004).

3.1.1. Transformational leadership and quadrant I.
Transformational leadership is often defined in terms of the four I’s: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Bass 1985). Transformational leadership has been operationalized (Hoyt and Blascovich 2003) as emphasis on (1) the task, (2) far-reaching contributions, and (3) importance of questioning assumptions and originality. The behaviors in this quadrant (broker and innovator), focused on encouraging and facilitating change and maintaining external legitimacy, could potentially be seen as surrogates for the inspirational motivation and intellectual stimulation aspects of this leadership style.

3.1.2. Directive leadership and quadrants II and III
Quinn (1984) associated Quadrants II and III with an authoritarian leadership paradigm. This view is consistent with current articulations of directive leadership where leadership is defined in terms of guiding participation and seeking compliance with directions for
accomplishing assigned tasks (Kahai et al. 2004; Bass et al. 1975). Essentially, directive leadership implies that the leader plays an active role in problem solving and decision making and expects the group to be guided by his/her behavior.

3.1.3. Participative leadership and quadrant IV
Participative leadership is characterized by increased follower participation and is defined as the equalization of power and shared problem solving between leaders and followers (Bass 1990). This type of leader behavior is thought to improve team performance through increased participation (Quinn 1984).

3.1.4. Leadership behaviors and performance
While support can be found in the leadership literature to support all eight of our leadership behaviors positively impacting group performance, our specific context of virtual, self-managed teams may benefit from some of these behaviors more than others. For example, transformational leadership has been empirically linked to virtual team performance (Hoyt and Blascovich 2003), perhaps mediated by perceptions of group potency – defined as the collective belief in a group that it can be effective (Guzzo et al. 1993) – over time (Sivasubramaniam et al. 2002).

Previous research has linked directive leadership styles to lower performance in face-to-face teams (Cruz et al. 1999) and improved group participation and performance in technology-supported teams (Kahai et al. 2004). The decreased performance (in face-to-face teams) was attributed to fewer opinions and less information being exchanged compared to teams without appointed leaders. The improved performance (in technology-supported teams) was attributed to the directive leader’s ability to reduce role ambiguity, thus improving confidence and motivation to participate. Further, it has been argued that the relationship between directive leadership and performance is moderated by task structure – i.e. directive leadership is positively related to performance for more structured tasks (Kahai et al. 2004; Kahai, Sosik, and Avolio 1997).

Participative leadership can be especially effective in combination with the collaborative technologies used by virtual teams because it is consistent with the spirit of promoting participation intrinsic to these tools (Kahai et al. 2004). However, participative leadership is more likely to emerge in teams with long-term rather than short-term orientations, and with relationship rather than task foci, while directive leadership is often advocated in situations with short time horizons (Bass 1990) as is the case with the project teams used in this study. Barge and Hirokawa (1989) make a distinction between task and relationship communication competencies to permit clearer analysis of how these competencies support group processes and outcomes, and they suggest that different group situations (characterized by differences in task complexity, climate, and role relationships) require different proportions of task or relationship competencies.

Given our virtual setting, the structured nature of our task and the finite life-span of our project teams, we expect the presence of the roles in Quadrants II or III (Producer, Director, Coordinator, or Monitor) to improve the performance of our self-managed project teams.
Thus, we hypothesize:

H2: The communication exchanges among high-performing teams will be characterized by a higher incidence of directive leadership behaviors compared to low-performing teams.

3.2. Concentrated versus shared leadership

While much of the existing work on leadership in teams has focused on a single appointed leader, scholars have recently begun to challenge this notion and have called for investigations of shared leadership and its impact on team outcomes (Pearce and Conger 2003). This model defines leadership as a collection of roles and behaviors that can be split, shared, and rotated with multiple leaders existing within a team at any given time (Barry 1991). Behavioral leadership theories identify two basic behavior categories: initiating structure and individualized consideration. Recent work suggests that individualized consideration – despite its name – can be exhibited collectively by team members (Avolio and Bass 1995).

Work focused on self-managed teams provides additional support for the concept of shared leadership. Typical conceptualizations of such teams include an external leader (i.e., not a direct participant in the team) who is responsible for initiating structure and goal setting, while the team members themselves are responsible for executing and monitoring the work (Wageman 2001). Proponents suggest that self-managed teams have the potential to enhance organizational performance by tapping into employee’s intellectual and creative capacities (Wageman 1997). The seemingly critical component of such teams rests with each member’s willingness to create interdependent work processes and take joint responsibility for the outcomes. Researchers have focused on understanding the multiple roles played by the external leader to better develop a sense of how these roles can be separated and replicated within the team (Wageman 2001), suggesting that in these types of teams, shared leadership is related to better team outcomes.

Recent work on the conceptualization of shared leadership is promising. Enactment of leadership behavior by most or all of a team’s members has been found to be more predictive of team performance than more traditional, concentrated leadership (House and Aditya 1997). Much of this work has focused on perceptions of shared leadership (c.f., Avolio et al. 2003) over time as specific roles are negotiated among team members (Taggar, Hackett, and Saha 1999; Seers 1989). While actual behaviors have not been studied, we expect the relationship between actual behavior and performance to be consistent with the relationship between perceived behavior and performance. Therefore, we hypothesize:

H3a: The communication exchanges among high-performing teams will be characterized by a higher incidence of shared leadership behaviors compared to low-performing teams.

Further, recent work has investigated the relative influence of concentrated versus shared leadership on team performance (Pearce, Yoo, and Alavi 2003). Virtual teams often lack a designated leader (Tyran, Tyran, and Shepherd 2003), and self management is frequently required in a virtual context due to the geographic distance separating team members from the designated leader when one exists (Zigurs 2003). As such, each member must also
individually take responsibility for: (a) structuring work processes; (b) understanding the interdependence that exists between their assigned tasks and those of other members; and (c) developing a sense of individualized consideration (often characterized by mutual trust and respect for each other’s ideas and feelings). In essence, members must feel jointly and severally responsible for the team’s task (Tyran et al. 2003). Often, such concentrated leadership behaviors are viewed as “leading by example,” where the individual members move the group forward through their own work (Pearce and Conger 2003). Thus, we propose:

H3b: The communication exchanges among high-performing teams will be characterized by a higher incidence of concentrated leadership behavior compared to low-performing teams.

3.3. Timing

The group process literature (c.f., Gersick 1988) suggests that teams are likely to establish their relational interaction patterns early on, then largely maintain them until or unless they encounter a discrepant event forcing a change in pace or process (Majchrzak et al. 2000). The same might be expected for leadership behaviors – i.e. effective patterns of leadership behavior early on would provide the team a solid relational foundation as they move into more task-focused behavior in later stages. A time-lagged effect of leadership behavior on team outcomes has been empirically substantiated (Van Dierendonck et al. 2004). Thus, we hypothesize:

H4: Leadership behaviors exhibited early in the team’s lifecycle will be associated with team performance while leadership behaviors exhibited later will not.

4. Research Design and Measures

4.1. Design

Data for this study was collected from 22 virtual teams that completed a semester-long database class project in an undergraduate database course. The members of the teams were located at three different universities located in Oklahoma, Michigan, and Maryland. The teams were not assigned a formal leader and met the criteria for self-managed work teams – they were faced with developing a product involving interdependent tasks, and they had discretion over decisions such as work assignments, methods, and scheduling of activities (Goodman, Devadas, and Hughson 1988). All team interactions were captured and archived using a freely available web-based collaborative technology (Yahoo! Groups). Each team was provided a message board for exclusive use by their group, along with a public board, which was available for questions and answers for all teams. In all, almost four thousand messages were exchanged. That the task was directly relevant to the students’ experience and course of study is consistent with DeSanctis’ (1988) suggestion that any concerns about
the use of student respondents are lessened if the students are performing relevant tasks within their experience (for example, MIS majors developing E-R diagrams for a database class). Participant demographics are provided in Table 2.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in years)</td>
<td>22.7 (4.60)</td>
</tr>
<tr>
<td>Work experience (in years)</td>
<td>3.98 (4.02)</td>
</tr>
<tr>
<td>Grade point average</td>
<td>3.15 (0.44)</td>
</tr>
<tr>
<td>Gender</td>
<td>Male = 81</td>
</tr>
<tr>
<td></td>
<td>Female = 24</td>
</tr>
</tbody>
</table>

4.2. Measures

4.2.1. Leadership behaviors
Messages exchanged in each team were read and incidents of each of the eight leaderplex behaviors were identified within each message. The number of incidents coded within each message theoretically could range from zero (i.e. the message contained no incidence of any leadership behavior) to eight (where all eight leadership behaviors were evident). Thus, the unit of analysis in this case was an incident of actual leadership behavior within each message. Then, for each team, the number of times each behavior was exhibited was tallied. A first coder evaluated all messages in all 22 teams. A second coder evaluated two randomly selected teams and interrater reliability was adequate at 93.8% [measured as 1 – (number of disagreements / (number of messages × number of behaviors))] indicating that the first coder was applying the coding scheme in a replicable fashion. This formula has been used in previous research (c.f., Dennis et al. 1997). We modified it to reflect our unit of analysis – the actual incidence of behaviors – by multiplying the number of messages by eight (which represented the actual number of behaviors).

4.2.2. Concentrated leadership behaviors
Concentrated leadership behavior was calculated by dividing leadership behavior by the number of individuals who engaged in it. For example, if Team 1’s e-mail exchanges included 8 incidents of mentoring behavior all provided by the same user, then the individual leadership behavior score for mentoring in Team 1 would be 8. Alternatively, if Team 2 engaged in 8 incidences of mentoring, but they were contributed by 4 different users, the individual leadership behavior score would be 2. Both teams would have the same leadership score (8) on this behavior.

4.2.3. Shared leadership behaviors
In order to assess the extent to which the team shared responsibility for leading, a shared leadership score was computed. For this construct, leadership score was multiplied by the
percentage of the team that engaged in the behavior. Using the above example, shared leadership for Team 1 would be $8 \times (1/5)$ – assuming the team had five members – or 1.6. Alternatively, Team 2’s score would be 6.4.

4.2.4. Performance

Our dependent variable was the performance of each team. This variable was assessed on a 100-point scale by each of the three instructors (from the universities represented in this project) after engaging in a calibration exercise. The average of the three scores was used for data analysis. The coders used to assess leadership behavior and the instructors used to assess team performance were two separate groups with no overlapping members.

4.2.5. Time and task

Deliverables from the project were assessed at four different time periods after the completion of different tasks related to database design and implementation. The first task was the development of a rough-draft conceptual data model using Microsoft VISIO. The outputs from this exercise were assessed and the teams were provided direction for improving their models. The second deliverable was the final draft conceptual model. Working from further feedback on their conceptual models, the teams developed a logical model – their third deliverable. Finally, the teams were provided a populated Microsoft Access database and asked to develop input forms, reports, and queries. Percentage scores were assigned to each deliverable. Each task built on the previous one culminating in the most complex, interdependent task.

5. Results

Taking into account the longitudinal nature of the data, we began our analysis by splitting our sample into high and low performing teams. First, we averaged each team’s scores over the four time periods, and then we calculated the overall average for all 22 teams. Using this mean ($\bar{x} = 88.81$), we split the sample, which resulted in 10 high-performing teams and 12 low-performing ones. Our analysis then focused on the differences in behavior across these samples. Before comparing leadership behaviors across these teams, though, we first assessed whether there were any differences in ability. Using self-reported GPA as a surrogate for ability, we found no significant differences between the two sets of teams ($p = .19, \bar{x}_h = 3.202, \bar{x}_l = 3.113$).

We assessed the difference in total number of leadership behaviors exhibited over the life of each team. Our one-tailed t-test results suggest that emergent leadership behavior was significantly different in high- and low-performing teams in the direction we anticipated ($p = .03, \bar{x}_h = 148.20, \bar{x}_l = 118.08$). Thus, hypothesis H1 was supported. Next, we examined whether differences in individual behaviors exhibited might account for the performance differences observed between the teams. The results of this test are provided in Table 3. As this table shows, while the overall counts of leadership behavior were significantly higher for high-performing versus low-performing teams, the incidence of different leadership behaviors varied. High-performing teams were higher on five out of the eight
Table 3. Results of t-tests for leadership behaviors.

<table>
<thead>
<tr>
<th></th>
<th>Innovator</th>
<th>Broker</th>
<th>Monitor</th>
<th>Coordinator</th>
<th>Facilitator</th>
<th>Mentor</th>
<th>Director</th>
<th>Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>p-value (one-tailed)</td>
<td>0.28</td>
<td>0.30</td>
<td>0.07</td>
<td>0.39</td>
<td>0.48</td>
<td>0.26</td>
<td>0.17</td>
<td>0.00</td>
</tr>
<tr>
<td>Mean (low performers)</td>
<td>2.08</td>
<td>8.08</td>
<td>24.17</td>
<td>11.67</td>
<td>22.08</td>
<td>5.75</td>
<td>42.42</td>
<td>64.90</td>
</tr>
<tr>
<td>Mean (high performers)</td>
<td>1.60</td>
<td>9.10</td>
<td>29.60</td>
<td>12.50</td>
<td>21.90</td>
<td>1.50</td>
<td>7.10</td>
<td>64.90</td>
</tr>
</tbody>
</table>

Table 4. Shared versus concentrated leadership behaviors.

<table>
<thead>
<tr>
<th></th>
<th>Innovator</th>
<th>Broker</th>
<th>Monitor</th>
<th>Coordinator</th>
<th>Facilitator</th>
<th>Mentor</th>
<th>Director</th>
<th>Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared Leadership p-value (one-tailed)</td>
<td>0.23</td>
<td>0.43</td>
<td>0.06</td>
<td>0.34</td>
<td>0.25</td>
<td>0.25</td>
<td>0.10</td>
<td>0.15</td>
</tr>
<tr>
<td>Shared Leadership Mean (low performers)</td>
<td>0.72</td>
<td>4.27</td>
<td>17.40</td>
<td>6.86</td>
<td>14.40</td>
<td>0.50</td>
<td>2.07</td>
<td>12.57</td>
</tr>
<tr>
<td>Shared Leadership Mean (high performers)</td>
<td>0.44</td>
<td>4.58</td>
<td>22.74</td>
<td>5.89</td>
<td>12.19</td>
<td>0.37</td>
<td>3.30</td>
<td>13.90</td>
</tr>
<tr>
<td>Concentrated Leadership p-value (on-tailed)</td>
<td>0.36</td>
<td>0.18</td>
<td>0.31</td>
<td>0.29</td>
<td>0.12</td>
<td>0.31</td>
<td>0.48</td>
<td>0.00</td>
</tr>
<tr>
<td>Concentrated Leadership Mean (low performers)</td>
<td>1.63</td>
<td>4.03</td>
<td>8.31</td>
<td>5.28</td>
<td>8.07</td>
<td>1.63</td>
<td>4.25</td>
<td>39.33</td>
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<tr>
<td>Concentrated Leadership Mean (high performers)</td>
<td>1.40</td>
<td>4.88</td>
<td>8.70</td>
<td>5.98</td>
<td>9.37</td>
<td>1.40</td>
<td>4.22</td>
<td>55.12</td>
</tr>
</tbody>
</table>

behaviors but only two were significantly higher (Monitor at $p < 0.10$ and Producer at $p < 0.01$). These results provide partial support for hypothesis H2 in that the only behaviors significantly different among high- and low-performing teams were those associated with the directive quadrant of the Leaderplex Model.

Concentrated and shared leadership behaviors were considered next. Assessments of total number of concentrated leadership behaviors ($p = .02$, $\bar{x}_h = 52.27$, $\bar{x}_l = 43.17$) and shared leadership behaviors ($p = .05$, $\bar{x}_h = 74.68$, $\bar{x}_l = 95.78$) were both significantly different between high- and low-performing teams. Thus, hypotheses H3a and H3b were supported. To investigate the source of these differences, we conducted a variety of post hoc tests, which are explained below.

Investigating differences among the eight leaderplex behaviors, we found Monitor behaviors to be significantly different when shared and Producer behaviors to be significantly different when concentrated. The results of this test are presented in Table 4. Next, we assessed the impact of the leadership behaviors over time (H4). Given that only Producer and Monitor behaviors were significant, we looked specifically at the time-lagged effect of these over the four time periods using overall, shared, and concentrated measures of the leaderplex behaviors. These results are presented in Table 5. We find that in both cases higher performing teams exhibited these behaviors earlier in their life-cycle and more frequently than lower performing teams, providing partial support for hypothesis H4.

A summary of our results and the conclusions drawn regarding our hypotheses is provided in Table 6.
Table 5. Leadership behaviors over time and task.

<table>
<thead>
<tr>
<th>Leadership behavior (Overall)</th>
<th>Monitor</th>
<th>Producer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time1</td>
<td>Time2</td>
</tr>
<tr>
<td>p-value (1-tailed)</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>Mean (low performers)</td>
<td>4.67</td>
<td>6.17</td>
</tr>
<tr>
<td>Mean (high performers)</td>
<td>7.20</td>
<td>9.30</td>
</tr>
<tr>
<td>Leadership Type (Specific)</td>
<td>Shared</td>
<td>Concentrated</td>
</tr>
<tr>
<td>p-value (1-tailed)</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Mean (low performers)</td>
<td>3.32</td>
<td>4.61</td>
</tr>
<tr>
<td>Mean (high performers)</td>
<td>5.82</td>
<td>7.68</td>
</tr>
</tbody>
</table>

Table 6. Summary of hypotheses testing.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: The communication exchanges among high-performing teams will be characterized by a greater number of actual leadership behaviors compared to low-performing teams.</td>
<td>Supported, overall behavior counts were significantly higher for high-performing teams.</td>
</tr>
<tr>
<td>H2: The communication exchanges among high-performing teams will be characterized by a higher incidence of directive leadership behaviors compared to low-performing teams.</td>
<td>Partially supported, producer and monitor behaviors were significantly higher for high-performing teams.</td>
</tr>
<tr>
<td>H3a: The communication exchanges among high-performing teams will be characterized by a higher incidence of shared leadership behaviors compared to low-performing teams.</td>
<td>Supported, overall shared behaviors were higher for high-performing teams. Among specific behaviors, shared monitor behavior was significantly higher among high-performing teams.</td>
</tr>
<tr>
<td>H3b: The communication exchanges among high-performing teams will be characterized by a higher incidence of concentrated leadership behavior compared to low-performing teams.</td>
<td>Supported, overall concentrated behaviors were higher for high-performing teams. Among specific behaviors, concentrated producer behavior was significantly higher among high-performing teams.</td>
</tr>
<tr>
<td>H4: Leadership behavior exhibited early in the team's lifecycle will be associated with team performance while leadership behaviors exhibited later will not.</td>
<td>Partially supported, shared monitor and concentrated producer behaviors exhibited early were significantly different among high- and low-performing teams, later behaviors were not.</td>
</tr>
</tbody>
</table>

6. Discussion

Overall, results of our analysis support the premise that leadership matters in self-managed virtual teams. Given that our data are derived from the messages exchanged by members of the virtual teams, and the fact that the exchange of messages in such teams is the only form of communication, we were able to examine directly the relationship between actual communication exchanges related to leadership and objective measures of performance. To provide additional context to our analysis, we found that high-performing teams did exchange more messages overall ($p = .086$, $\bar{x}_h = 188.1$, $\bar{x}_l = 150.2$). However, more
Germane to the focus of this study, high-performing teams exchanged more messages related specifically to leadership behaviors. Previous researchers investigating message counts in virtual environments as they relate to leadership found emergent leaders might send more messages (Yoo and Alavi 2004) or they might not (Sarker, Grewal, and Sarker 2002), but they do send messages richer in content (Yoo and Alavi 2004; Sarker et al. 2002). Further, our results provide support for the communication competency model of team leadership (Barge and Hirokawa 1989). Our high-performing teams sent more messages and engaged in significantly more leadership-oriented behaviors in the messages they sent.

6.1. Do performance differences mean leadership differences?

Drilling down, we investigated which leadership behaviors were significantly different among high- and low-performing teams and found Monitor and Producer behaviors significantly higher among the high-performing teams. These behaviors are consistent with directive leadership theory as articulated earlier in this paper, and our results are consistent with previous empirical findings (Kahai et al. 1997). Behaviors in other quadrants representative of transformational and participative leadership were not significantly different among high- and low performing teams providing additional support for our hypothesis that it is directive behaviors that will impact teams such as those studied here – i.e. limited duration, virtual, and self managed.

While there is a significant body of research linking transformational leadership to team performance in a number of domains, this linkage recently has come under fire (Jung and Avolio 2000). For example, Jung (2001) found transformational leadership negatively associated with performance on a short-duration task. Further, results from both the virtual and the self-managed team contexts are equivocal. Hoyt and Blascovich (2003) found that transformational leadership was associated with performance that was qualitatively better but not quantitatively better in virtual teams suggesting a need to match leadership style to performance goals. Further, Politis (2002), studying knowledge acquisition teams, found that transformational leadership was not a pre-existing condition for achieving desirable performance in self-managed teams. Our teams were virtual, self-managed and engaged in a relatively short duration task. And consistent with this previous work, transformational leadership was unrelated to performance.

Participative leadership behaviors, characterized in our data by facilitating and mentoring, are focused on encouraging follower comments and contribution. Participative leadership has been previously linked to higher member participation in electronically supported workgroups (Kahai et al. 2004). However, this previous work manipulated leadership style in a context where an appointed leader existed. In our self-managed teams, neither facilitator nor mentoring behaviors were significantly different in high- versus low-performing teams. Communication aimed at facilitator behaviors was exchanged quite often (monitoring and producing were the only behaviors engaged in more often) but did not differ in high- versus low-performing teams. Further, mentoring behaviors were rarely exhibited in our teams. Manz and Sims (1987) suggest that a participative leadership style exhibited by the external leader of a self-managed team is helpful; our results suggest that communication among
team members focused on participative leadership behaviors was generally not as helpful. While not significant, both facilitator and mentoring behaviors were higher among the low-versus high-performing teams.

6.2. Shared versus concentrated leadership

Not surprisingly, the high-performing teams in our study seemed to focus on the task, a result that is consistent with previous outcome-focused characterizations of leadership, where a leader’s first priority was successfully executing the task (Bell and Kozlowski 2002). However, of the leadership behaviors observed in the high-performing teams, one—Producer behavior—was concentrated, while another—Monitor behavior—was shared. This dichotomy suggests that two aspects of leadership play an important role in virtual self-managed teams: One, individuals with specific skills play a key task-based leadership role by using their expertise to execute the task and lead the group by example. Two, individual expertise alone may not be enough to lead such teams. Collectively, members of the team must monitor group activities and move the group forward in a participative manner to successfully accomplish the task.

Example messages exchanged between members of our high performing teams are provided in Table 7 (monitoring behavior) and Table 8 (producer behavior). In one high-performing group, for instance, a member posted the following message:

What entities and relationships does everyone see right off the bat? I know for sure that there is a Student/applicant Company and I think there is a job entity. A company can have one to many job listings. I’m not exactly sure how the student ties in, that may be only after the position is filled...

The above behavior (coded as Producer behavior) is focused on engaging the team in the task at hand—designing the entity-relationship diagram. The proactive message poster even starts the ball rolling. In another high-performing team, the following exchanges occurred:

I found a few things wrong. You use both GROUP BY and ORDER BY in some places where you only need one or the other. Query number 2 doesn’t return the correct results. You only pulled out two records, but there should be 5 (I compared tables). You’re pretty much right, but probably something little getting in the way. Might have to do with that RID and CID thing you mentioned. Also, I’m not using the INNER JOIN thing, I’m doing the good old WHERE thing which is just like doing and INNER JOIN.

Also the schema will need to be updated and I noticed that Joe and Nick had conflicting schema. Let’s work that out.

Here the message posters (displaying Monitor behavior), shared the responsibility for ensuring that their team is on track to produce a high-quality deliverable. Members of this high-performing team—representative of others—were jointly engaged in active conversations focused on monitoring progress and helping to move their group forward. It is important to note that previous work suggests that shared leadership focused on management-by-exception can negatively impact group performance by focusing on failure (Sivasubramaniam et al. 2002) however; effective self-managed teams must monitor and
Table 7. Monitoring behavior.

I found a few things wrong. You use both GROUP BY and ORDER BY in some places where you only need one or the other. Query number 2 doesn’t return the correct results. You only pulled out two records, but there should be 5 (I compared tables). You’re pretty much right, but probably something little getting in the way. Might have to do with that RID and CID thing you mentioned. Also, I’m not using the INNER JOIN thing, I’m doing the good old WHERE thing which is just like doing INNER JOIN.

It is okay to have the subtypes ACCEPTED and REJECTED? It does make sense, but aren’t entities usually nouns? One error I noticed: The O is for overlap, not optional. O allows a student to reject and accept an offer, while “d” allows for an offer to either be accepted or rejected. The one line though allows for an offer to exist without being accepted or rejected.

Also the schema will need to be updated and I noticed that Joe and Nick had conflicting schema. Let’s work that out.

I think that we should use Matt’s model, but I have a few suggestions. 1. I think that OFFER should be an associative identity between STUDENT and POSITION. This will cut down on the redundancy of storing person_id and position_id more than once. Also, I am assuming that starting salary will be the same, no matter who receives the offer, so that would also be redundant. 2. I think that there should be a COMPANY entity. Companies often have multiple recruiters, and the form that has been provided for the company to sign up asks for an address, URL, and phone number. I think that we could either have the entity be related to RECRUITER or we could change PERSON to USER and use the company as a USER type. 3. I am not sure what to do about placement, but it may warrant its own entity. It would not be associative because each student will only accept one offer, and associative entities have to be many to many. So those are my suggestions.

I think I found a mistake. The skills attribute both in student and position need to be multi-valued attributes since there will probably be more than one of them.

I know that this is pretty late to make changes, but now that I look over the associative entities that are between STUDENT and SKILL and SKILL and POSITION, I am not sure that we should include those associative entities at all. This is my reasoning, let me know if I am making sense: Since the only attributes that we are trying to store are Skill ID and Student ID/Pos ID, they seem unnecessary. If we changed them to regular relationships called “Possesses” and “Requires” we would not need to store any attributes on them, thus making the existence of associative entities unnecessary.

Table 8. Producer behavior.

What entities and relationships does everyone see right off the bat? I know for sure that there is a Student/applicant Company and I think there is a job entity. A company can have one to many job listings. I’m not exactly sure how the student ties in that may be only after the position is filled...

Hey, I posted revision 2. Will somebody look at it and make sure it is kosher? Right now I’m going to modify the repository to reflect the changes.

Still working on the repository... kinda out of it... so might want to check stuff. Also, would someone update my revision 2 in order to reflect the changes to RECRUITER-post-JOB?

The two main entities that stand out after reading through are STUDENT and COMPANY. I will take student and compile a list of attributes if someone else wants to take company and do the same.

I posted a copy of the data repository, we aren’t required to have the domain and null done, so I left them blank. Also, I didn’t know what data item meant, so if you wanna let me know what its for I can put that in.

I have just uploaded d2_model_v2.2-137 of our model. This has Philip’s suggestions of the regular entity type for MAJOR. I also updated the attributes page for both MAJOR and STUDENT to reflect this. However, this model does have the foreign keys in it. I will take a look at the public area and read the messages on foreign keys. If we take them out, do we just make them into regular attributes? I think at this late hour, that would be what I would suggest. Anyone else?
manage on-going work processes (Wageman 2001). Thus, our results suggest that in this study our successful teams engaged in shared monitoring focused on tracking quality and meeting deadlines. However, they had to simultaneously avoid any perception that they were tracking each other’s mistakes.

While the focus of producing and monitoring suggests that our high performing teams were very task focused, it may also provide evidence of relational development. Higher levels of commitment to individual and shared goals, as evidenced by shared monitoring behavior, may be evidence of effective peer working relationships (Seers 1996). The team’s willingness to allow one member to take the lead on a task also suggests some level of trust may have developed.

6.3. Leadership patterns over time

Given the importance of the Producer and Monitor behaviors and the longitudinal nature of our data, we examined whether these behaviors evolved over time or remained static. Our findings suggest that Producer and Monitor behaviors were important early in the life of the high-performing teams. Both behaviors – the former in a concentrated fashion and the latter in a shared fashion – were engaged in by members of the high-performing teams early in their groups’ lives. While they persisted throughout their groups’ lives, their significance declined after the mid-point. The group process literature (c.f., Gersick 1988) suggests that teams are likely to establish their relational interaction patterns early on, then largely maintain them until or unless they encounter a discrepant event forcing a change in process (Majchrzak et al. 2000).

The same might be expected for leadership behaviors – i.e. effective patterns of leadership behavior early on would provide the team the guidance they need as they move into more task-focused behavior in later stages. Our results concerning the temporal impact of leadership behaviors observed in self-managed virtual teams are consistent with previous investigations of leadership behaviors in traditional face-to-face teams (Van Dierendonck et al. 2004). In other words, leadership behaviors – regardless of group type – need to be established early in order to impact performance. The existence of these behaviors later in a group’s life, while not unimportant, appears to serve more of a maintenance function.

7. Conclusions

Researchers have only recently begun to focus their efforts on understanding the implications of being virtual on the roles and behaviors of team leaders. Much has been written to suggest that leadership is vital for success in this new organizational form; however, the form that this leadership should take and what constitutes best practice in this emerging realm is not clear. Such uncertainties are amplified among virtual teams that function as self-managed entities. Given the limited empirical evidence in this area, our study focused on identifying emergent leadership behaviors that were most strongly associated with the performance of self-managed virtual teams. Further, we investigated what type of leadership – concentrated or shared – mattered over time.
Our findings suggest that in such environments, shared monitoring and concentrated producing behaviors were more likely to be exhibited by high-performing teams. Further, our findings suggest that time matters. Leadership behaviors exhibited early in the team’s life were more predictive of success than those exhibited later. Moreover, the high-performing teams focused on task accomplishment early on and stayed focused. Two likely byproducts of the shared commitment to high quality team outcomes are better relational development and greater trust among team members (Seers 1996).

These results have clear implications for practice. They indicate that a combination of individual and collective leadership behaviors is needed to ensure the success of self-managed virtual teams. This combination consists of individual production behavior – wherein members lead the group by utilizing their skills in executing the task at hand – and shared monitoring behavior – wherein members move the group forward by coordinating activities and keeping track of deliverables. Thus, good performance appears contingent upon members displaying two types of leadership: contributing their individual expertise to the group and being a team player. In other words, “I’ve done my part, now it’s their turn,” does not seem to be a recipe for success in self-directed settings. In addition, being engaged in what other members are doing and ensuring they remain on track appear to be equally important ingredients for success. Moreover, these behaviors need to be established early in the life of the group, if they are to impact ongoing performance. Our study suggests that new models of leadership are needed to understand the complex relationship between leadership behaviors and performance over time in the emerging self-managed virtual team environment.

Acknowledgements

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Note

1. Given the high interrater reliability it was decided that additional coding by the second coder would not produce any additional insight.

References


EMERGENT LEADERSHIP IN VIRTUAL TEAMS


