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Emergent Leadership in Self-managed Virtual Teams: A Replication

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Abstract:

Carte, Chidambaram, and Becker (2006) conducted a longitudinal study of 22 self-managed virtual teams in order to better understand the differences in leadership behaviors engaged in by members of high- versus low-performing teams. We conducted a conceptual replication of this study in an attempt to examine the robustness of its findings. Our data were collected in a different country (Sri Lanka versus US), using different subjects (MBA versus undergraduate students) grouped into 24 teams that were collocated (rather than geographically distributed) but still using a CT and engaged in different tasks (judgement versus intellective) than the original study. Two of the five hypothesized results were replicated, indicating that certain characteristics of high-performing virtual teams seem universal. However, the remaining differences between the studies point to the influence of task, culture, and geographic dispersion of members in determining effective leadership behaviors in self-managed virtual teams.

Keywords: replication, computer-mediated communication, leadership

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Introduction

Carte, Chidambaram, and Becker (2006) argued that organizations are increasingly using distributed teams because such teams are made feasible by improvements in communication technologies (Kahai et al. 2004; Sarker et al. 2002). In fact, such teams are now common place (Misiolek and Heckman 2005). However, these authors argued, an in-depth understanding of leadership behaviors in such teams is still lacking (Sarker et al. 2002; Zigurs 2003). They studied 22 geographically distributed teams, coded the messages exchanged for incidents of leadership behavior and drew conclusions about the leadership exhibited in high- versus low-performing teams. This paper has been cited in both the IS and management literature, but its findings have not been further tested.

In our study, we examined the same question addressed in Carte et al. (2006) in an attempt to determine the robustness of their findings. However, we made some intentional changes to their design. Our data were collected in a different country – Sri Lanka – to gain some understanding of whether the previous behavior-related findings generalize across different cultures. Further, our teams were MBA students with significant experience, enabling us to study if previous findings are robust to team member experience. In addition, our study used team members who were collocated, but using a collaborative technology (CT), highlighting potential differences between geographic dispersion and CT use. Finally, our study utilized a series of non-cumulative case studies compared to a single cumulative technology development assignment used in Carte et al. (2006) in order to draw some conclusions about the role of task. There were also differences that were less focused on specific understanding and more artifacts of our design: 1) the time gap between deliverables was 2 weeks for each (the previous study had a slightly longer gap between deliverables 2 and 3), 2) while our measure of performance was still instructor assessment, the different nature of the deliverable (i.e., system development versus writing) likely resulted in differences in measurement, and 3) coding was performed by a different coder[1]. As such, while our study has some elements of a methodological replication there are likely sufficient differences as to label our study a conceptual replication.

1 Previous Results

Utilizing the Leaderplex Model (see Figure 1), Carte et al. (2006) coded and counted the number of times each team engaged in 8 key leadership behaviors. They found that high performing teams engaged in more leadership behaviors, with significant differences in the number of monitoring and performing behaviors in high- versus low-performing teams (i.e., high performing teams engaged in more of these behaviors).

Figure 1: Leaderplex Model Adapted from Denison, Hooijberg, and Quinn (1995)

Further, they investigated shared (e.g., enactment of leadership behavior by all or most of a team) versus concentrated leadership (depth of leadership by each individual team member) and found that high-performing teams engaged in more shared monitoring behavior and concentrated producer behavior than

[1] Our second coder was the same second coder as in the original study

low performing teams. Finally, the role of time was investigated and the results suggest that leadership performed earlier in a team's life impacts performance more than behaviors engaged in later.

2 Methods

The sample for our study was comprised of 127 students (male=80, female=47) enrolled in an MBA course within a premier MBA program in Sri Lanka. The program attracts high-quality, experienced managers and all courses are taught in the evening to accommodate the students' fulltime employment while completing their MBA. Each subject was assigned to one of 24 teams; 15 five-member teams, one four-member team, and 8 six-member teams. During their Introduction to MIS course the teams were asked to complete four case write-ups over eight weeks with the deliverables equally spaced two weeks apart. An initial survey was administered to collect demographic data. Consistent with Carte et al. (2006), each team had a shared workspace in *Yahoo! Groups*, accessible only to team members and the instructor. While these teams were collocated, they were asked to complete the assignment using only *Yahoo! Groups*. We asked the participants to what extent the tasks were completed using *Yahoo! Groups* and they reported that they used the collaborative technology for the majority of their interactions[2]. A summary of the methodological choices across the original study and this replication are summarized in Table 1.

2.1 Leadership Behaviors

The communication exchanges within each team on *Yahoo! Groups* were archived and coded. Similar to the previous study, our measures of leadership behaviors were coded from communication exchanges. Each message was examined for incidents of leadership behaviors – again, an individual message could contain multiple behaviors. In all, 2,742 messages were exchanged and subsequently coded. Coding was conducted by two coders – one male and one female – and inter-rater agreement was sufficient with a Cohen's Kappa above .80. The ratings of the first coder were used. Each of the leadership behaviors were represented by the total number of times each individual demonstrated the behavior within each of the four time periods. Concentrated leadership behavior was calculated by dividing leadership behavior counts by the number of individuals in the team who engaged in it, and shared behaviors was calculated by multiplying the number of times a certain behavior was engaged by the percentage of team members who engaged in it. These measures are identical to those used by Carte et al. (2006).

3 Results

Consistent with Carte et al. (2006), we split our sample into high and low performing teams (using the mean of the overall performance as the breakpoint) and evaluated each of the original hypotheses via one-tailed t-tests. Our results are compared to the results found in Carte et al. (2006) in Table 2.

Table 1. Study Characteristics

	New Study	**Carte, et al. (2006)**
Task	Case Writing (less cumulative / less dependence between tasks)	Technology Development (cumulative)
Sample	MBA's	Undergraduates
Context	Collocated (eliminates anonymity as an explanation)	Virtual/Distributed
Location/Culture	Sri Lanka	USA

It is worth noting that we were only able to replicate the prior findings for two of the five hypothesis results. We could replicate specific leadership findings, but not overall findings. In order to better unpack the role of time and specific leadership behaviors, we present Carte et al.'s (2006) findings in Table 3 and our results in Table 4, using a quadrant format that mirrors the Leaderplex model.

[2] The participants were asked what percentage of their team's interactions occurred using phone calls, face-to-face meetings, and/or impromptu meetings. On average, respondents indicated that their teams used *Yahoo! Groups* 77.6% (responses ranged from a low of 75% to a high of 88%).

3.1 Additional analysis.

In addition to replicating the analysis conducted by Carte, et al., 2006, we also investigated potential alternative explanations[3]. We looked for differences in our high- and low-performing teams in other characteristics besides performance. We investigated: total number of messages exchanged ($\bar{X}_h$=125.9, $\bar{X}_l$=107.6, p=.157), group size ($\bar{X}_h$=5.76, $\bar{X}_l$=6.09, p=.190), and average age within team ($\bar{X}_h$=31.52, $\bar{X}_l$=30.96, p=.307). Our high- versus low-performing teams did not differ significantly on any of these. Further, we split our sample using random assignment and tested whether any leadership differences emerged. There was one significant finding – our random split produced significant differences in mentoring behaviors – as a result we have not interpreted any of our findings for mentoring.

Table 2: Comparison of Findings

Hypothesis	Carte, et al. (2006)	New Study
H1: The communication exchanges among high-performing teams will be characterized by a greater number of actual leadership behaviors compared to low-performing teams.	**Supported,** overall behavior counts were significantly higher for high-performing teams (p-value = .03).	**Not supported** (p-value = .112)
H2: The communication exchanges among high-performing teams will be characterized by a higher incidence of directive leadership behaviors compared to low-performing teams.	**Partially supported**, producer (p-value < .01) and monitor behaviors (p-value = .07) were significantly higher for high-performing teams.	**Not supported** (p-value = .190).
H3a: The communication exchanges among high-performing teams will be characterized by a higher incidence of shared leadership behaviors compared to low-performing teams.	**Supported,** overall shared behaviors were higher for high-performing teams (p-value = .05). Among specific behaviors, shared monitor behavior was significantly higher among high-performing teams (p-value = .06).	**Not supported** overall (p-value = .299), but supported for two specific behaviors: Shared Broker (p-value = .009) and Shared Producer (p-value = .046).
H3b: The communication exchanges among high-performing teams will be characterized by a higher incidence of concentrated leadership behavior compared to low-performing teams.	**Supported**, overall concentrated behaviors were higher for high-performing teams (p-value = .02). Among specific behaviors, concentrated producer behavior (p-value < .01) was significantly higher among high-performing teams.	**Supported**, overall concentrated behaviors were higher for high-performing teams (p-value = .0005). Among specific behaviors, concentrated producer (p-value = .037), concentrated coordinator (p-value = .042) and concentrated monitor (p-value = .026), behaviors were significantly higher among high-performing teams[4].

[3] We thank one of our anonymous reviewers for this suggestion

[4] While mentoring behaviors were also significant, we have eliminated these from discussion due to the spurious findings for mentor behaviors in our random split.

H4: Leadership behavior exhibited early in the team's lifecycle will be associated with team performance while leadership behaviors exhibited later will not.	**Partially supported,** shared monitor and concentrated producer behaviors exhibited early were significantly different among high- and low-performing teams, later behaviors were not.	**Partially supported**, innovator (overall, shared, and concentrated), broker (overall, shared, and concentrated), producer (overall, shared, and concentrated), and monitor (overall, shared, and concentrated) behaviors exhibited early were significantly different among high- and low-performing teams.

4 Discussion

In this study we performed a conceptual replication of Carte et al. (2006). Utilizing the same measures but altering the study design we attempted to understand to what extent their findings are robust. Specific differences in design included: the teams were collocated rather than distributed, masters students with significant experience participated versus more novice undergraduates, our sample was collected in Sri Lanka compared to a US-based sample, and our students engaged in four case writing deliverables with no interdependence versus a database project with deliverables that built on each other. We found support for two of the five hypotheses previously proposed and partially supported. Fundamentally, hypotheses focused on concentrated leadership, specific behaviors, and time produced more consistent results across the two studies.

4.1 Replicated Findings

Perhaps the most consistent finding between our study and Carte et al. (2006) was the support for H3b. Hypothesis 3b focused on concentrated (the number of times each individual team member engaged in a behavior). In general, research into concentrated leadership has focused on the value of formal leadership and the concentration of power or decision-making authority among few. Within the virtual team literature, concentrated leadership studies have focused on the value of individual members feeling responsible for the team task (e.g., Tyran et al. 2003). The measure used in Carte et al. (2006) and this study is focused on a level of dedication an individual members has to a particular leadership behavior.

The consistency in findings surrounding concentrated leadership among the previous study and this replication suggests that higher-performing teams have within them team members who engage in emergent leadership behaviors and persist in those behaviors. A specific leadership behavior that was significantly exhibited by high-performing teams in both studies was producer behavior. This was defined by Carte et al., 2006 (and coded in this study) as taking responsibility for completing part of the group task and encourages others to do the same. Recent work (Liao 2017) on leadership and individual contribution further confirms the importance of producer behavior. These authors proposed that a leaders' task-oriented behaviors focused on motivating individual team members to exert greater efforts on team tasks may lead to greater team performance.

The second finding that was consistent across both studies was the importance of early leadership behavior (H4). Hypothesis 4 was focused on the question of when high-performing teams engage in leadership behaviors. Both studies support the importance of early leadership behavior. Our higher performing teams clearly demonstrated the importance of early leadership on performance. Interestingly, our high-performing teams also demonstrated more leadership later in their lifecycles in comparison to lower-performing teams *and* in comparison to the original study. One potential explanation for this is the nature of our teams. Because they were collocated, the duration of the project teams did not necessarily equate to the duration of their interaction. Some group development researchers have attempted to understand the temporal patterning of group interactions using a concept known as the “shadow of the future” (Axelrod 1984). The shadow of the future covers all expected future interaction and shared outcomes, with long shadows at the beginning of a team’s lifecycle translating to greater effort and shrinking shadows as the endpoint approaches potentially leading to reduced efforts (Bouas and Arrow 1995). For virtual teams (VTs), previous

research has suggested that the shadow of the future impacts team members' efforts to develop relational ties such that temporary VTs are less likely to do so than on-going VTs (Saunders and Ahuja 2006).

Table 3: Carte, et al. (2006) Results

GDN DATA	QUADRANT IV								QUADRANT I							
Behavior	FACILITATOR				MENTORING				INNOVATOR				BROKER			
OVERALL	Time1	Time2	Time3	Time4	Time1	Time 2	Time 3	Time4	Time1	Time2	Time3	Time4	Time1	Time 2	Time 3	Time4
p-value (1-tailed)	**0.01**	0.20	0.23	*0.09*	0.28	0.18	0.21	0.42	0.37	0.29	0.25	0.46	0.46	0.49	0.27	0.44
Mean low performers	**3.67**	4.67	6.42	*7.33*	0.25	0.75	0.58	0.25	0.83	0.58	0.33	0.33	1.33	1.92	2.58	2.25
Mean high performers	**6.10**	5.80	5.20	*4.80*	0.40	0.40	0.40	0.30	0.70	0.40	0.20	0.30	1.40	1.90	3.40	2.40
CONCENTRATED LEADERSHIP																
p-value (1-tailed)	**0.05**	**0.03**	0.49	0.26	0.40	0.25	0.21	0.25	0.37	0.46	0.25	0.46	0.33	0.42	**0.03**	0.38
Mean low performers	**1.67**	**1.71**	2.10	2.59	0.25	0.63	0.58	0.17	0.58	0.38	0.33	0.33	0.93	0.98	**0.91**	1.21
Mean high performers	**2.76**	**2.38**	2.11	2.13	0.30	0.40	0.40	0.30	0.50	0.40	0.20	0.30	0.80	1.07	**1.62**	1.40
SHARED LEADERSHIP																
p-value (1-tailed)	**0.06**	0.40	0.16	*0.07*	0.21	0.14	0.25	0.38	0.34	0.16	0.28	0.46	0.29	0.38	0.48	0.36
Mean low performers	**1.98**	2.94	4.62	*4.47*	0.05	0.21	0.12	0.08	0.30	0.20	0.07	0.07	0.49	0.97	1.84	0.88
Mean high performers	**3.21**	3.25	2.88	*2.51*	0.12	0.08	0.09	0.06	0.23	0.08	0.05	0.06	0.76	0.79	1.77	1.06
Behavior	MONITOR				COORDINATOR				DIRECTOR				PRODUCER			
OVERALL	Time1	Time2	Time3	Time4	Time1	Time 2	Time 3	Time4	Time1	Time2	Time3	Time4	Time1	Time 2	Time 3	Time4
p-value (1-tailed)	**0.01**	**0.03**	0.40	0.46	0.48	0.37	0.11	0.45	0.22	0.23	0.33	**0.07**	**0.01**	**0.01**	0.29	0.20
Mean low performers	**4.67**	**6.17**	7.00	6.33	3.25	3.00	2.17	3.25	2.08	1.67	1.25	**0.75**	**7.33**	**9.33**	13.00	12.75
Mean high performers	**7.20**	**9.30**	6.60	6.50	3.20	2.60	3.60	3.10	2.60	1.40	1.50	**1.60**	**14.00**	**20.60**	14.60	15.70
CONCENTRATED LEADERSHIP																
p-value (1-tailed)	**0.08**	**0.08**	0.18	0.27	0.29	0.36	0.13	0.49	0.29	0.17	0.41	0.30	**0.04**	**0.00**	**0.08**	0.31
Mean low performers	**1.68**	**1.92**	2.28	2.44	1.08	1.30	1.29	1.61	1.26	1.33	0.90	0.75	**2.49**	**2.65**	**3.27**	3.86
Mean high performers	**2.06**	**2.53**	1.96	2.16	1.32	1.15	1.92	1.60	1.40	1.05	0.83	0.93	**4.06**	**5.84**	**4.07**	4.31
SHARED LEADERSHIP																
p-value (1-tailed)	**0.04**	**0.04**	0.41	0.49	0.18	0.27	0.12	0.45	0.25	0.42	0.24	**0.06**	**0.00**	**0.02**	0.43	0.15
Mean low performers	**3.25**	**4.52**	5.17	4.13	2.31	1.84	0.82	1.48	0.87	0.47	0.44	**0.15**	**5.60**	**7.23**	10.80	8.94
Mean high performers	**5.45**	**7.38**	4.80	4.18	1.39	1.15	1.62	1.58	1.30	0.44	0.68	**0.77**	**10.14**	**15.86**	11.30	11.85
	QUADRANT III								QUADRANT II							

Legend: Bold = significant relationship; Italics = significant in opposite of hypothesized direction / uninterpretable

As we turn to what specific behaviors exhibited early were associated with higher performance, we uncover some differences between the original study and ours. In Carte et al. (2006) early facilitator, monitor and producer behaviors were greater in high-performing teams, and in our study early innovator, broker, monitor and producer behaviors were greater in high-performing teams. Two of these behaviors are shared between the two studies: producer and monitor, which are both associated with a directive theory of leadership. This is notable, because there is no other leadership behavior shared by the high-performing teams in both studies in any of the subsequent time periods. Therefore, the importance of directive leadership theory (or at least producer and monitor behaviors) early in the life of a team may well be universal.

4.2 Inconsistent with Previous Findings

Our results did not support H1, H2, or H3a. Carte et al.'s data provided support or partial support for all three. In the following sections we provide some theoretical interpretation for these discrepancies based on the differences between our design and theirs.

Table 4: New Study Results

SRI LANKA DATA	QUADRANT IV								QUADRANT I							
Behavior	FACILITATOR				MENTORING				INNOVATOR				BROKER			
OVERALL	Time1	Time2	Time3	Time4	Time1	Time 2	Time 3	Time4	Time1	Time2	Time3	Time4	Time1	Time 2	Time 3	Time4
p-value (1-tailed)	0.36	0.23	0.31	0.46	0.20	0.47	0.33	**0.09**	**0.04**	0.17	0.17	N/A	**0.00**	**0.02**	0.19	0.39
Mean low performers	2.36	1.36	1.27	0.73	2.18	1.27	0.73	**0.36**	**0.00**	0.00	0.09	0.00	**0.18**	**0.27**	1.27	0.36
Mean high performers	2.69	1.77	1.46	0.69	1.69	1.31	0.92	**0.85**	**0.23**	0.15	0.00	0.00	**1.08**	**1.00**	1.69	0.31
CONCENTRATED LEADERSHIP																
p-value (1-tailed)	0.18	0.22	0.18	0.47	0.22	0.46	0.48	**0.08**	**0.04**	0.17	0.17	N/A	**0.00**	**0.01**	0.44	0.39
Mean low performers	1.17	0.82	0.94	0.64	1.21	1.00	0.64	**0.27**	**0.00**	0.00	0.09	0.00	**0.09**	**0.18**	1.09	0.36
Mean high performers	1.46	1.00	1.15	0.62	1.00	1.04	0.62	**0.58**	**0.23**	0.15	0.00	0.00	**1.00**	**0.81**	1.04	0.31
SHARED LEADERSHIP																
p-value (1-tailed)	0.44	0.43	0.44	0.39	0.23	0.42	0.22	**0.08**	**0.04**	0.17	0.17	N/A	**0.05**	**0.08**	**0.06**	0.39
Mean low performers	0.98	0.56	0.36	0.17	0.77	0.38	0.15	**0.09**	**0.00**	0.00	0.02	0.00	**0.07**	**0.09**	**0.28**	0.06
Mean high performers	1.06	0.62	0.39	0.15	0.59	0.33	0.26	**0.24**	**0.05**	0.03	0.00	0.00	**0.23**	**0.26**	**0.61**	0.05
Behavior	MONITOR				COORDINATOR				DIRECTOR				PRODUCER			
OVERALL	Time1	Time2	Time3	Time4	Time1	Time 2	Time 3	Time4	Time1	Time2	Time3	Time4	Time1	Time 2	Time 3	Time4
p-value (1-tailed)	**0.05**	0.39	0.27	0.30	0.33	0.16	**0.07**	0.24	0.49	0.24	0.22	0.25	**0.02**	0.40	0.31	**0.06**
Mean low performers	**3.09**	3.73	1.55	1.18	3.64	2.27	**1.45**	2.00	2.91	2.91	2.64	1.64	**2.64**	1.82	1.73	**0.82**
Mean high performers	**4.69**	3.46	1.85	1.46	4.23	3.00	**2.46**	1.54	2.92	2.31	1.85	1.15	**4.38**	2.00	2.00	**1.54**
CONCENTRATED LEADERSHIP																
p-value (1-tailed)	**0.10**	0.38	**0.09**	0.40	0.16	0.45	0.48	0.42	0.45	0.15	0.26	0.28	**0.01**	0.11	0.24	0.22
Mean low performers	**1.27**	1.53	**0.86**	0.76	1.32	1.36	1.09	1.02	1.26	1.13	0.99	0.85	**1.29**	0.82	0.91	0.64
Mean high performers	**1.68**	1.46	**1.19**	0.82	1.63	1.32	1.08	0.96	1.22	1.49	1.27	0.69	**1.84**	1.21	1.04	0.79
SHARED LEADERSHIP																
p-value (1-tailed)	**0.07**	0.37	0.31	0.38	0.42	**0.07**	**0.02**	0.25	0.47	*0.08*	*0.08*	0.20	**0.05**	0.44	0.23	**0.05**
Mean low performers	**1.50**	1.98	0.53	0.45	2.09	**0.82**	**0.43**	0.85	1.44	*1.56*	*1.66*	0.94	**1.15**	0.83	0.61	**0.22**
Mean high performers	**2.85**	1.73	0.66	0.53	2.28	**1.43**	**1.18**	0.59	1.40	*0.76*	*0.57*	0.38	**2.31**	0.77	0.91	**0.73**
	QUADRANT III								QUADRANT II							

Legend: Bold = significant relationship; Italics = significant in opposite of hypothesized direction / uninterpretable

4.2.1 Number of Messages

Hypothesis 1 suggested that the overall number of leadership behaviors would be higher in high-performing teams. Although our high performing teams did engage in more leadership behaviors, the disparity did not rise to a level of statistical significance ($\bar{X}_h$ =56.69, $\bar{X}_l$ =48.45, p=.112). This may be due to one or more of the differences in our study compared to Carte et al. (2006). Team members are more likely to assume leadership functions and responsibilities if they feel empowered to do so. Team empowerment is defined as increased task motivation due to team members' collective, positive assessments of their organizational tasks (Kirkman and Rosen 1999). There is empirical evidence to suggest that technology-supported teams are more capable of taking self-corrective actions to improve team processes the more virtual they are (i.e., the less they meet face-to-face) (Kirkman et al. 2004). This suggests that our collocated teams may have felt less empowered to assume (rather than being appointed to) a leadership role. Further, the difference in culture may have impacted our participants' willingness to engage in the proactive leadership behaviors we coded. Sri Lankan culture has been characterized as high on power distance (Weathersby 1993) perhaps leading our participants to be less inclined to engage in emergent leadership – instead looking for the formal assignment of a leader. Finally, the nature of our task as well as the team members' level of experience may explain why there was not a significant difference in number of messages exchanged between high- and low-performing teams. The group writing task assigned to experienced managers likely did not require a significant number of messages to encourage individual members to engage in the task.

4.2.2 Directive Leadership

Hypothesis 2 argued that the directive leadership style – defined in terms of guiding participation and seeking compliance with directions for accomplishing assigned tasks (Bass et al. 1975; Kahai et al. 2004) – would provide the biggest differences in high- versus low-performing teams. While partially supported for

the Carte et al. (2006) study overall and in this study when incorporating time effects, our high-performing teams did not demonstrate more directive leadership overall. Essentially, directive leadership implies that the leader plays an active role in problem solving and decision making and expects the team to be guided by his/her behavior. This difference in results may be attributable to the differences in culture between the US and Sri Lanka. Using Hofstede's (1980) dimensions of national culture, in addition to being high on power distance, Sri Lankan culture has been characterized as high on uncertainty avoidance, collectivist (rather than individualist) and nurturing (versus assertive) (Weathersby 1993). High power distance and uncertainty avoidance create resistance to empowerment and self-managed teams; collectivism facilitates empowerment as does the nurturing dimension (Randolph and Sashkin 2002). However, more nurturing cultures can lead to a greater focus on team development and not enough on team performance. As a reminder, our findings are not about whether these behaviors were demonstrated, but rather whether they contributed to higher performance; however, one could argue that individuals engage in the behavior due to a belief that it will result in better outcomes. Our Sri Lankan participants may have not only been less likely to engage in directive leadership, but were less responsive to it as well.

In addition, the effectiveness of directive leadership can be impacted by the nature of the task. Directive leaders impose structure on a task (Kahai, et al, 2004). In the original study, the task was a structured database development task. In our replication the task was a group writing task, likely perceived as relatively unstructured. This may provide an additional explanation for why directive leadership among our teams did not result in higher performance.

Finally, it is also noteworthy that, while the overall directive leadership behavior counts (quadrants II and III) did not have a significant impact on leadership in our teams, the high-performing teams in our study had their performance impacted by Quadrant I behaviors and this was not the case in the original study. The roles in Quadrant I focus on flexibility and external factors. Burns' (1978) described transformational leadership as inspiring commitment and sacrifice in each follower and seeking to engage "the full person of the follower". Transformational leadership has been operationalized with questions focused on (1) the task, (2) far-reaching contributions, and (3) importance of questioning assumptions and originality (Hoyt and Blascovich 2003). The behaviors in this quadrant (broker and innovator), focused on encouraging and facilitating change and maintaining external legitimacy. Again, this may be due to differences in culture – specifically the more nurturing element of the Sri Lankan culture. Further, given the experience of our participants and the nature of the task, engaging the external community may have been more meaningful. For example, some of these messages reference contacting the authors of case studies being used in order to get a better understanding of the case.

Overall, H2 was weakly supported by Carte et al. (2006) and not supported in our findings; however, the time-based findings for both studies point to the importance of directive leadership. This suggests that directive leadership and team performance is an area that needs much more research. We believe our findings shed light on the need to consider time (or team lifecycle), the task, team experience, and cultural issues.

4.2.3 Concentrated and Shared Leadership Behaviors

Prior work using the Leaderplex Model (Vilkinas and Cartan 2006) identified a two-factor solution that grouped facilitator, mentor and innovator as socially-oriented behaviors and broker, producer, director, coordinator and monitor as task-oriented behaviors. In both the previous study and our study, the preponderance of shared and concentrated leadership impactful behaviors engaged in by high-performing teams were task-oriented. This is likely related to the time-constrained nature of the teams. However, compared to the original study, the high-performing teams in our study saw a much wider spectrum of task-oriented behaviors impact performance.

The previous study task, developing a database, had a "right answer." As such, it could have been completed (with enough time) by any one member alone. By definition, this makes it an intellective task (McGrath 1984; Straus 1999). In our study, the task required judgement (i.e., a case study that asks what the organization should do); as such, our high performing teams would have needed to engage in some consensus building. This makes it a judgement task requiring more interdependence (McGrath 1984; Straus 1999), and effective performance on an interdependent task relies more heavily on task-focused leadership (Burke et al. 2006).

Another explanation exists for the differences in results concerning H3a. The high-performing US-based teams in Carte et al.'s (2006) study exhibited significantly higher levels of shared monitor behavior impacting

performance, while the high-performing Sri Lanka-based teams exhibited higher levels of shared producer behavior impacting performance. That is, the high-performing teams in our study required less monitoring and more producing. This might be generally indicative of a stronger sense of personal responsibility in the Sri Lankan culture or among our more experienced participants.

5 Conclusion

Carte, et al. (2006) developed a good first step toward understanding emergent leadership and its role in team performance for geographically distributed teams engaging in computer mediated communication. Our results suggest that a few of their findings appear to be robust across very different contexts. High-performing teams in both studies were marked by higher incidences of concentrated leadership behaviors than low-performing teams. Additionally, high-performing teams in both studies engaged in more instances of producer and monitor behaviors early on than low-performing teams, regardless of the distribution of these behaviors amongst members. Thus, some characteristics of high-performing virtual teams seem to hold true regardless of the context.

Our study demonstrates that in addition to the mode of communication (i.e., face-to-face versus computer mediated) the dispersion of team members (i.e., distributed versus collocated), task, and culture all seem to impact the nature of effective leadership behaviors. This both suggests the need for and paves the way for a more nuanced understanding of emergent leadership behaviors in self-managed virtual teams.

Finally, it is worth noting that this study as well as the original one were constrained in the data analysis techniques available given relatively small sample sizes and the use of count data. Further replication should attempt to overcome this using other methods (e.g., survey data rather than behavioral counts) as well as collecting data from larger samples (this may require focusing on a single point in time).

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