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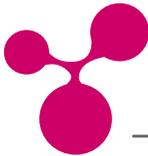
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D.4   Shared leadership in virtual teams: the impact of Cognitive, affective and behavioural team leadership on team performance

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Abstract

The present investigation is concerned with shared leadership and team performance in a sample of 20 organizational virtual teams. We examine shared team leadership in terms of cognitive processes (team learning), affective processes (perceived team support), and behavioural processes (team member exchange quality). Our findings document internal validity of the shared leadership model, and high external validity in predicting team performance. Findings are discussed with regard to management of virtual teams in organizations.

1   Einleitung

A broad shift towards team-based work structures in organisations has taken place in the past few years. Today, teams represent the 'building blocks' of organisations and traditional hierarchies have often been replaced by team-based work forms (Bell & Kozlowski, 2002; Burke, Stagl, Klein, Goodwin, Salas, & Halpin, 2006; Wegge & Schmidt, 2007). As a consequence, new approaches and insights regarding effective team leadership, such as shared leadership or distributed leadership (e.g., Day, Gronn, & Salas, 2006; Pearce & Conger, 2003; Wegge, 2004), are intensively discussed in the literature. Shared or distributed leadership can be defined as a 'collaborative, emergent process of group interaction in which members engage in peer leadership while working together' (Pearce & Conger, 2003, p.53). Additionally, in light of the increasing de-centralization and globalization of work processes, many organizations have introduced virtual team work. Virtual team members are geographically dispersed and coordinate their work predominantly with electronic information and communication technologies (e.g., e-mail, video-conferencing; e.g., see Hertel, Geister, & Konradt, 2005 for a recent review). Leadership in virtual teams is known to be particularly difficult. Scholars focusing on leadership of virtual teams have argued that leaders, owing to lower co-presence, have less influence and less information about the team's situation and the management of team processes should consequently be impaired (e.g. Bell & Kozlowksi, 2002; Duarte & Snyder, 1999; Hertel, Geister & Konradt, 2005). With limited information about the team's situation, the management of team dynamics and the development of adequate practices (e.g., uncovering conflicts to motivate team members, to maintain performance, and to

develop trust and team cohesion) are more difficult to maintain. However, as this type of team work "empowers" team members (e.g., there is often no direct control of supervisors; team members set goals participatively; responsibility is delegated and shared), participative or shared forms of leadership are often recommended as the most effective leadership strategy in virtual teams (e.g., Hertel et al., 2005; Hoch, 2007; Wegge, Bipp, & Kleinbeck, 2007). However, as discussed below, studies on this issue are rather scarce and obtain inconsistent results. Thus, the main goal of this study is to garner more empirical evidence on this issue. More specifically, as shared leadership has not yet been examined in virtual teams, we present and test a new model of shared leadership in virtual teams, investigating if shared leadership is indeed effective in achieving high team performance in virtual teams.

2 Shared Leadership in Organisations

Shared leadership describes 'the collective influence of members in a team on each other […] which guides toward the teams goals (Sivasubramaniam, Murry, Avolio, & Jung, 2002, p.67). In general, shared leadership has been documented to be positively associated with team performance, as it might optimize information flow, high motivation, positive emotion, and all kind of other positive team processes within teams (e.g., Pearce & Conger, 2003; Pearce, 2004; Pearce, Perry, & Sims, 1999). However, so far only a few empirical attempts have been made to test this general hypothesis (e.g., Avolio, Sivasubramaniam, Murry, Jung, & Garger, 2003; Pearce & Sims, 2002). Particularly, with regard to shared leadership in virtual teams, there has been no research conducted so far.

If we focus on *virtual* teams and potential differences regarding leadership in regular and virtual teams we find a debate in the literature (e.g., Avolio, Kahai, & Dodge, 2001; Gibson & Cohen, 2003; Hinds & Kiesler, 2002). Two arguments are very prominent in this discussion. First, due to the reduced co-presence, leaders of virtual teams might have only limited information about the team's situation so that the management of team dynamics and the development of adequate practices might be impaired in virtual teams (e.g., Hertel et al., 2005; Hinds & Kiesler, 2002). Consequently, employees in virtual teams would need *more* structure and procedural assistance than members of face-to-face teams (e.g., Bell & Kozlowski, 2002; Gibson & Cohen, 2003; Hinds & Kiesler, 2002). Second, in view of the high distribution of work processes and the greater equality among organisational members in virtual teams, leadership should be delegated and shared among the virtual team members to a greater extent (Shamir, 1999, p. 50; Yukl, 2002).

The empirical results with respect to the validity of such a hypothesis are not clear yet. Puranova and Bono (in revision), for instance, found that transformational leadership was very effective in virtual teams but results from Howell and Hall Merenda (1999) suggested that supervisor leadership was less efficient under high geographic dispersion

than under low dispersion (e.g., Howell, Neufeld, & Avolio, 2005). In addition, results from another study (Howell & Hall Merenda, 1999) showed that supervisor leadership was related to performance to a lesser extent under conditions of high geographic dispersion than under low dispersion. However, another form of supervisor leadership which focuses more on the longitudinal relationship of dyadic work-related exchange, namely leader-member exchange (LMX, Graen & Cashman, 1975), was found as not being affected by geographic dispersion at all. In their longitudinal field study of 317 employees, Howell and Hall Merendas (1999) showed that leadership was similarly related to follower performance both in close and distant settings. Finally, Wegge et al. (2007) recently found that participative goal setting lead to increased performance in particular in virtual working conditions. Therefore, we assume that participative and shared forms of leadership may be particularly effective in virtual teams. As will be outlined next, we believe that a sound empirical test of such ideas should be based on a broader conception of shared leadership that incorporates at least three facets of this construct: cognitive, affective and behavioural.

3   Shared Leadership in Virtual Teams: A new Empirical Conceptualisation

Shared leadership is defined as a goal-directed, active process where leadership is enacted simultaneously or sequentially within teams by team members. Regarding the measurement of shared leadership, however, there have not been many empirical concepts mentioned in the literature so far. We therefore believe that in order to measure shared leadership it is important to differentiate between the three main mechanisms that leaders utilize to have an impact on team performance: Leaders try to influence how a team thinks, feels and behaves (for a more detailed prescription of this rationale, see Hoch, 2007 and Wegge, 2004). In other words, we suggest that a conceptualization of shared leadership should be build on the many insights from research that show the importance of cognitive (e.g., goal setting), affective (mood induction), and behavioural processes (e.g., division of labour in teams, e.g., Kozlowski & Bell, 2003). Our study was designed to assess these three facets simultaneously.
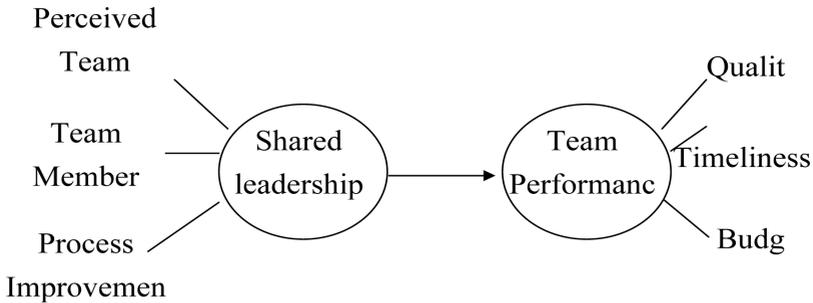
Figure 1: Hypothesized Relationship between Shared Leadership and Team Performance in Virtual Teams

Cognitive processes mainly refer to 'the processes necessary to the collective acquisition of knowledge within a team' (Kozlowski & Bell, 2003, p.346). According to Kozlowski and Bell (2003, p.346) key to such learning processes are defining the team task, setting priorities and role division, such as engaging in team process improvement behaviour (e.g., Edmondson, 1999; Edmondson, Bohmer, & Pisano, 2001). This behaviour describes 'a team taking action, obtaining and reflecting upon feedback, and making changes to adapt or improve'. We know from prior research that feedback-seeking in general is related to increases in performance, within a team as well as outside it (e.g., Ashford & Tsui, 1991). We therefore assume that team process improvement behaviour should be one sub-facet of efficient shared leadership in virtual teams.

Affective processes describe a climate, collective mood or group emotion such as climate of perceived support (Kozlowski & Bell, 2003). A key affective process according to Kozlowski and Bell (2003, p.346) is *perceived team support* (PTS; see Bishop, Scott, & Burroughs, 2000; Eisenberger, Cummings, Armeli, & Lynch, 1997), which is 'the extent to which members believe that the team values their contribution and cares about their well-being' (Bishop et al., 2000). PTS is adapted from Eisenberger, Huntington, Hutchison, and Sowa (1986) perceived organisational support (POS), which positively predicts success in organisations (e.g., Eisenberger et al., 1997). We therefore propose that team perceived team support should be one sub-facet of efficient shared leadership in virtual teams.

Behavioural processes describe the quality of communication and cooperation of the members within teams. According to Kozlowski and Bell (2003, p.346) the quality of *team member exchange* (TMX, see Seers, 1989), which is 'quality of task-related exchange within a team', is a key behavioural team process. Integrating status differences, power distribution and mutual influence (e.g. Blau, 1964), TMX has

been related to job satisfaction and team efficacy (Seers, 1989). We therefore suggest that team member exchange should be one sub-facet of efficient shared leadership in virtual teams.

In sum, shared leadership in the present investigation is seen as a construct with three different sub-dimensions: cognitive, affective and behavioural forms of shared leadership. Our first hypothesis is therefore focused on supporting this argument. We hypothesise that findings from confirmatory factor analysis will support the three-factor structure of the shared leadership model in our sample of virtual teams.

Hypothesis 1: Confirmatory factor analysis will support a three-factor structure solution for the shared leadership model.

Additionally, in line with what we stated in the theoretical section, we expect shared leadership to be effective also in virtual teams. When work is distributed across different levels in the organisation, leadership should be more evenly shared, distributed and collectively performed within the team (see also Figure 1). In line with this rationale, we hypothesise that shared leadership will positively predict team performance in virtual teams.

Hypothesis 2: Shared-team leadership will be positively related to team performance in virtual teams.

4 Method

Sample
Participants of the study were 125 subordinates and their supervisors from twenty virtual teams in different companies. Virtual teams worked on average on two different sites per team (range from 1 to 5), and on average 450.21 kilometres (*SD* = 15.41) away from each other. Their communication was mainly via electronic communication media (relative amount of electronic communication was .71%, range 50% to 88%). In terms of gender, 68.3% of the participants were male, and 31.7% were female. Age of the participats varied from 22 to 59 (*M* = 36, *SD* = 8.54). In general, teams were working on construction tasks and in R & D departments of the different companies. Team size varied from three to seventeen with a mean of 4.53 (*SD* = 3.07) team members. The average daily labour time of the employees accounted for 8.43 hours (*SD* = 4.40).

Procedure
Several team leaders and human resource managers were invited to take part in the study. They received logins and passwords for all their employees. These logins and passwords were randomly distributed to the participants. After completing the questionnaires, which were available in English and German, each team received feedback on the team level regarding their results.

Measures

Team Process Improvement was measured by a 4-item scale adapted from Edmondson (1999). A sample item is "We regularly sit together and try to improve our work processes." Alpha of the scale was .93.

Perceived Team Support (PTS) was measured by a (shortened) 5-item scale adapted from Eisenberger and colleagues (1986). A sample item is "My team cares about my general satisfaction at work." The Alpha was .88 (one item deleted).

Quality of Team Member Exchange was assessed by a (shortened) 5-item scale documented by Bishop and colleagues (2000), which was based on Graen (1976). A sample item is "My working relationship with my colleagues is effective." The Alpha of the scale was .90.

Superior performance ratings were based on a scale developed by Gemuenden and Hoegl (2001). Supervisors were asked to rate their team's performance in terms of (a) quality, (b) schedule/timeliness and (c) budget, on a scale ranging from 0 to 100% ($\alpha = .79$).

5 Analyses

We tested for within-consistencies of ratings by computing r_{wg} *values* (James, Demaree & Wolf, 1984). Since all the above-mentioned teams exhibited levels of .70 and higher on the operationalised scales, data (except for *CFA*, Hypothesis 1) were aggregated and analyses were performed on team-level data.

The hypotheses were tested with the partial least square (*PLS*) structural equation model (Ringle, Wende, & Will, 2006; Wold, 1985). *PLS* is being adopted by a growing number of group-team researchers (e.g., Sambamurthy & Chin, 1994). We chose *PLS* because it does not make assumptions about data distributions, and thus is highly suitable for early stages of theory testing and small sample sizes. As significances in PLS are not automatically computed we used the bootstrapping procedure and tested the resulting T-scores for significance.

6 Results

Means, standard deviations and correlations of study variables are presented in *Table 1*. The three leadership dimensions of cognitive, affective and behavioural leadership are modestly correlated. However, only TMX leadership was related to team performance. Therefore findings from SEM analysis are important (see next paragraph), to see whether all the three leadership facets are important dimensions of shared leadership.

	M	SD	1	2	3	4	5	6	7
1, PIC	3.35	.67	-						
2, PTS	3.18	.37	.56**	-					
3, TMX	3.81	.47	.46**	.69**	-				
4, Performance	82.67	2.36	.03	.17	.31*	-			
5, Age	37.80	8.86	.30	.17	.24	.15	-		
6, Gendera	1.30	.49	.27	.27	-.16	-.18	-.18	-	
7, Work Time	9.96	5.69	.00	.07	.12t	.07	-.31	-.01	-

Note, N = 20 Teams, Significance (two-tailed) ** p < .001, * p < .01; a: 1 = male, 2 = female; PIC (Process Improvement), PTS (Perceived Team Support), TMX (Team Member Exchange)

Table 1: Mean Scores, Standard Deviations and Correlations of Study Variables.

For testing the first Hypothesis we computed CFA analysis (AMOS 5.0, Arbuckle, 2003). Findings obtained an acceptable model fit (χ^2 (74) = 113.88, p < .02, χ^2/df = 1.54, CFI = .97, NFI = .92, RMSEA= .06). The three-factor model explained 73.59 % of the variance. This model fitted the data much better than simpler conceptions of shared leadership (e.g., a one factor model χ^2 (77)= 458.22, p < .001, χ^2/df = 5.95, CFI = .97, NFI = .66, RMSEA= .20; with $\Delta \chi^2$ = 244.34, p < .001). Further, as can be seen in Table 2b, all three components of shared leadership, that is cognitive, affective and behavioural leadership, were related to overall "shared leadership", as the factor loadings were all significant at p < 0.01. So, despite the lower correlations in Table 1, all three dimensions were important. In sum, these results support Hypothesis 1.
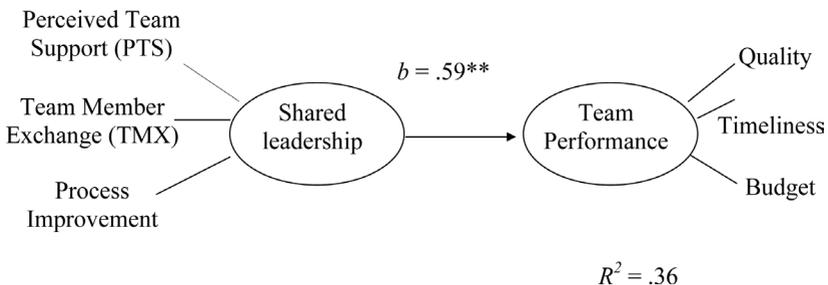

Figure 2: Findings, Shared Leadership as Predictor of Team Performance in Virtual Teams

Our second Hypothesis was concerned with the relationship between shared leadership and team performance. Results from *PLS* analysis show that shared leadership significantly predicted performance ($b = .59$, $p < .001$, see *Table 2a, Figure 2*). The model explained 36% ($R^2 = .36$) of the variance in the dependent measure, which is quite high. The amount of declared variance in the indicator (*AVE*, Fornell & Larcker, 1981), which should be larger than .50, were .63 for shared leadership and .88 for team performance, and were thus both acceptable. Hence, the findings also supported our second Hypothesis.

	b (origin.)	b (estimated)	SE	T	R^2
Shared Leadership → Performance	.60**	.59**	.13	4.63**	.36

Note: N = 20 Teams, b = Beta-weight, SE = Standard Error, T: ** p < 0.01, * p < 0.05

Table 2a: PLS Inner Model Analysis.

	λ	SE	T
PIC → Shared Leadership	.86	.14	6.09**
PTS → Shared Leadership	.33	.12	2.76**
TMX → Shared Leadership	.83	.14	6.01**
Budget → Performance	.38	.16	2.42**
Quality → Performance	.41	.19	2.07**
Time → Performance	.67	.08	8.46**

Note: N = 20 Teams, λ = Factor loading, SE = Standard Error, T: ** p < 0.01, * p < 0.05,

Table 2b: PLS Outer Model Analysis (Factor Loadings).

7 Discussion and Implication of Findings

In sum, our results show that shared team leadership is a valid predictor of team performance in virtual teams. From a *theoretical point of view* our findings document that shared leadership is important in today's organisations, and leadership in virtual teams is indeed (at least to some extent) shared and collectively performed by team members. As employees rated shared leadership and supervisors rated performance, our results are not sensitive to common source bias which further strengthens their validity. Despite the small sample size at the team level, shared leadership displayed a strong relationship with performance and explains a considerable amount of variance in performance. Shared leadership therefore displays an important influential value in

virtual teams. Shared leadership processes may, however, be something that a team is not always aware of, and consequently, such processes may go unnoticed.

From a more *practical point of view* it is important to provide suggestions for improvement of shared leadership (e.g., by training). In the following, we present such options for the three sub-compounds of shared leadership. That is, we suggest how each of the three dimensions could be used in order to strengthen them. *Affective shared leadership* points to how important it is to *feel as a team*. Climate of support may be related to a feeling of belonging or 'we' in a team, which in turn may relate to affective processes such as emotional contagion (Totterdell, Kellet, Teuchmann, & Briner, 1998), or affective status (e.g., George, 1990) within teams. This could be improved, for instance, by increasing awareness, collective identification or aspects of organisational support, as PTS derives from there (Eisenberger et al. 1986), Aspects of team composition may also be relevant as it was found that high levels of agreeableness and low levels of neuroticism are beneficial for teamwork (e.g., Barrick, Stewart, Neubert, & Mount, 1998). *Cognitive leadership* focuses on how to *think* as a team. Here it is important to clarify team goals, task interdependence, and the workflow within a team. In addition, active search for feedback, error-monitoring and team reflection are important in order to increase the quality of the team mental model and shared knowledge within a team (e.g., Lewis, 2003; Cannon-Bowers et al., 1993). Team mental model, shared knowledge, and also a climate of transparency and sharedness are necessary to provide, instead of hide, information. With regard to information-storage, however, also the necessary technical support such as electronic communication media or advanced information technology should be provided. *Behavioural leadership* implies that it is necessary to *act as a team*. Here, communication and team-focused training are most important. As behavioural (implicit) rules and regulations are sometimes developing slowly and might also constantly change over time, the team should seek to set up rules and regulations on how to interact, communicate and cooperate with each other. It thus may be necessary to have a successful kick-off workshop at the beginning of virtual team work but also to set up regular team reflection meetings later on. Moreover, some coaching or external team leader guidance from time to time may be also beneficial for effective teamwork.

In closing, we should note that this study is not without limitations. First, findings were based on cross-sectional data and we can therefore not derive any 'causal' relationships. Findings should therefore be replicated and extended in longitudinal analysis. A second limitation is that we did not include any supervisory leadership. We therefore don't know, if supervisor and shared leadership add to each other. We further don't know if high peforming teams are better because they are led in a more participative way and therefore develop more shared leadership. Another fruitful way for research therefore would be to include participative supervisor leadership and to

examine it's impact on shared leadership and team performance in virtual teams. In sum, our study focused on shared leadership in virtual teams. It was assumed that in more distributed workplaces and virtual teams, leadership should be also distributed in order for teams to be more effective. We developed and tested a new concept of shared leadership including cognitive, affective and behavioral facets. Our results provided empirical support for this concept. Thus, we recommend that more research on shared leadership in virtual teams should follow this approach.

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