

Effective Lean-Team Interactions through Leader Values and Members' Information Sharing Behaviour

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Abstract

Leaders are often blamed when lean work-floor initiatives fail. We hypothesise that lean-team leaders' work values affect their team members' information sharing behaviour and, through them, attain more effective team interactions. 429 survey responses of leaders and members of 25 lean-teams in service and manufacturing organisations were analysed through structural equation modeling, linear regression analyses, and Sobel tests. The positive relationship between lean-team effectiveness and leaders' self-transcendence values, and the negative relationship between lean-team effectiveness and leaders' conservation values were partly mediated by team information sharing behaviour. Future research must compare the content of effective lean-team interactions to non-lean teams.

Keywords: Lean Management, Team-effectiveness, Leadership

Introduction

Many work-floor teams that begin with lean fail to keep sharing ideas for improvement and to solve problems on an everyday basis (Hines *et al.*, 2004; Scherrer-Rathje *et al.*, 2009). Although we know that implementing lean requires leaders at all organisational levels to change their own mind-set and behaviour towards continuous improvement, root-cause analysis, and respect for people, most leaders struggle before reaching such "lean thinking" (Hines *et al.*, 2004; Moyano-Fuentes and Sacristán-Díaz, 2012). Lean has also been associated with higher levels of stress, tension, anxiety, and conflict (Hasle *et al.*, 2012). Thus, in order to help aspiring lean work-floor level teams (or: "lean-teams"), and their leaders, to learn about better work-floor interactions, scholars have urged the study of teams' micro behaviours and associated work values (Bardi and Schwartz, 2003; Detert *et al.*, 2000; Prajogo and McDermott, 2005). Such "soft" Organisational-Behavioural analyses at the lean-team work-floor level are still largely absent (Bhamu and Sangwan, 2014; Bortolotti *et al.*, 2015; Van Dun and Wilderom, 2012).

Team members' behaviours are influenced by their team leaders' values (Bardi and Schwartz, 2003; Schein, 1996): Team leaders are seen as behavioural compasses for the workers they supervise (Cropanzano *et al.*, 1993). This assumption fits the Input-Process-Output (IPO) theory that aims to "generalize leadership effects [i.e., the effect of their values] to the team level [i.e., behaviour and team effectiveness]" (Kozlowski and Ilgen,

2006, p. 114). Specifically, we refine in this paper the leadership levers to improve team information sharing (Kozlowski and Ilgen, 2006). Team members' information sharing has been defined as: "the provision of task information and know-how to help others and to collaborate with others to solve problems, develop new ideas, or implement policies or procedures" (Wang and Noe, 2010, p. 117). Deichmann and Stam (2015) urged the study of members' sharing of ideas in relation to leaders' values. This study empirically examines two sets of lean-team leader values that are associated with members' information sharing behaviour and effectiveness. We now present six hypotheses.

Theory: Values, Information Sharing, and Lean-Team Effectiveness

Below, relevant Operations Management literature on lean is paired to work values theory and work-unit effectiveness. Brown and Treviño (2009) adapted Schwartz *et al.*'s (2012) values to work settings; the original four values clusters are: "self-transcendence," "self-enhancement," "conservation," and "openness to change." Whereas the self-transcendence cluster entails other-focused values, such as "altruism" and "teamwork," the self-enhancement cluster consists of self-focused values, such as "ambition" and "taking initiative." The largely change-averse values in the conservation cluster are "conformity" and "tradition," while the openness to change values entails risk-taking through "experimentation" and "daringness."

Few scholars have empirically studied managerial values in lean organisations, let alone the values of *lean-team leaders*. Van Dun *et al.* (2016) found that effective lean middle managers predominantly espouse self-transcendence values, while not endorsing self-enhancement or conservation values. Five specific values were prevalent: "honesty," "participation and teamwork," "candour," "responsibility," and "continuous improvement." Most of these lean managerial values are clearly others-focused or self-transcendent: "employee empowerment," "cooperation," "continuous improvement," "openness," "responsibility," "empathy," "trust," "respect for people," "humility," and "customer focus" (Bicheno and Holweg, 2009; Emiliani, 2003; Liker and Convis, 2012). Self-transcendence values are particularly effective if leaders aim to support their teams rather than control them (Sosik *et al.*, 2009), resulting in higher worker effectiveness (Fu *et al.*, 2010). In fact, self-transcendence values, such as teamwork, trust, empowerment, and support, lead to higher levels of member's job satisfaction (Ooi *et al.*, 2007), which is a known predictor of team effectiveness. Thus, *H1: The more lean-team leaders endorse self-transcendence work values, the higher their teams' effectiveness.*

Leaders who promote lean often tend to be more forward than backward looking (Poksinska *et al.*, 2013). The advocated continuous improvement requires the elicitation of workers' insights and creativity which presupposes lean leaders have non-conformistic attitudes (Bicheno and Holweg, 2009). Lean expects workers to contribute towards improvement, while also demanding workers to stick to work standards to maintain quality and efficient product or service flows (Kosuge *et al.*, 2010; Spear and Bowen, 1999). Lean values, such as "humility" (Bicheno and Holweg, 2009), "integrity" (Liker and Hoseus, 2010), and "respect" (Bicheno and Holweg, 2009; Emiliani, 2003; Liker and Convis, 2012), might be associated with conservation. There might be some gains from conservation-oriented leader values in lean work places. However, conservative leader values (i.e., stability and predictability) are related to low lean performance (Zu *et al.*, 2010) and low financial performance (Sturdivant *et al.*, 1985). Thus, team leaders with conservation values are less likely to advocate change, question the efficiency of long-existing practices, or encourage employees to voice new ideas, etc.. Hence, *H2: The more lean-team leaders endorse conservation work values, the lower their teams' effectiveness.*

This study also examines information sharing as a key behavioural process underlying effective teamwork (Salas *et al.*, 2005). Supervisor support is known to predict team information sharing (Ilgen *et al.*, 2005; Kozlowski and Ilgen, 2006; Mesmer-Magnus and DeChurch, 2009; Nonaka, 1994; Swift and Virick, 2013): If team leaders are open and accessible to their employees, they create psychologically safe climates in which members feel welcome to share their ideas and information (Hirak *et al.*, 2012; Wong *et al.*, 2010). If team leaders are focused on self-transcendence values such as collaboration and consultation, team members will contribute more ideas for improvement (De Long and Fahey, 2000; Lam *et al.*, 2015). Similarly, high ratings of collectivistic or self-transcendence values are positively linked to work group knowledge sharing (Wang and Noe, 2010). Hence, *H3: Lean-team leaders' self-transcendence work values are positively related to their team members' information sharing behaviour.*

While leaders' promotion of cooperation may enhance members' information sharing (Mesmer-Magnus and DeChurch, 2009), such sharing is assumed to drive team performance by tapping workers' unique contributions (Ilgen *et al.*, 2005; Mathieu *et al.*, 2008). Team information sharing is an important precondition for team learning, innovation and performance, as it exposes team members to a larger and richer pool of ideas and data so that lean-teams can optimize their processes (Hines *et al.*, 2004; Ilgen *et al.*, 2005). Also, Berson *et al.* (2008) found that CEO self-transcendence values are associated with supportive work contexts which enable members to cooperate and attain higher organisational performance. Sufficient information sharing among team members and the associated team effectiveness may demand from team leaders self-transcendence rather than power-based values (MacNeil, 2004). Hence, *H4: The positive relationship between lean-team leaders' self-transcendence work values and team effectiveness is mediated by the degree of information sharing within the team.*

On the other hand, team leaders with conservation values are more likely to protect the status quo and limit member behaviours that might change extant work practices (Schwartz *et al.*, 2012). De Long and Fahey (2000) found that organisations with low levels of change readiness discourage an open sharing of knowledge. Supervisors who dislike information sharing are likely to fear a reduction of their own power (Wang and Noe, 2010). Under such conditions, team members are more likely to suppress the sharing of their thoughts and stick to the existing work standards, also in lean-team settings (Delbridge, 1995). As noted by Nonaka (1994), team leaders should not discourage team discussions. Thus, *H5: Lean-team leaders' conservation work values are negatively related to their team members' information sharing behaviour.*

It is assumed that if team leaders endorse conservation, lean work teams will score *low* on information sharing and mistakes will (re)occur more likely. Conservation values emphasize self-restriction (Schwartz *et al.*, 2012) and discourage open sharing of information. This curbs potential performance improvement, manifesting in anti-innovation behaviour among teams. It was found that if managers fail to establish a motivational climate, members start to hide information, thereby diminishing their own creativity and inducing a distrust loop (Černe *et al.*, 2014). In turn, this leads to lower production quality or negative team effectiveness (Sturdivant *et al.*, 1985). Hence, *H6: The negative relationship between lean-team leaders' conservation work values and team effectiveness is mediated by the degree of information sharing within the team.*

Method

Sample and Data-Collection

All the survey scales were pilot tested on seven lean-team leaders and their 70 members. After factor and reliability analyses as well as participants' feedback, redundant items were deleted. The main study respondents included 34 leaders ($M_{age} = 42$ years; 26.5% females; 94.1% worked full time; $M_{team\ tenure} = 4$ years and 5 months) and their team members ($n = 395$; $M_{age} = 41$ years; 34.7% females; 71.4% worked full time; $M_{team\ tenure} = 5.5$ years). The teams in the main study varied in size (ranging from five to 44 members), male/female ratio (four teams employed only men; four mostly women), and educational level (ranging from 31 members with lower vocational education to 19 members with master degrees). The team leader response rate was 97% and of the team member sample, 82%. Five teams were eliminated from the hypotheses-testing dataset because their leaders had not completed the values survey. The 25 remaining teams operated in ten medium- to large-sized organisations in the Netherlands. 15 were service-oriented teams: Their main tasks varied from assisting clients with civil registry, maintaining ICT, or processing insurance claims. Ten teams were from four manufacturing firms; they assembled, e.g., electric razors or lighters, or wired up products. All teams had adopted a lean strategy and had installed tools such as employee suggestion systems; communication boards; daily monitoring meetings; and value stream mapping. The 25 teams had, on average, adopted lean for two years and four months.

Measures and Construct Validation

The survey consisted of two parts: 1) a section on values, completed by the team leaders; and 2) a part on team-level information sharing behaviour and team effectiveness, completed by the team members.

Team leaders' work values – Schwartz *et al.*'s (2012) original and Brown and Treviño's (2009) additional "self-transcendence" and "conservation" scales were supplemented with values from the literature (Liker and Hoseus, 2010; Van Dun *et al.*, 2016). Then a principal axis exploratory factor analysis (EFA) was conducted, with *oblique* rotation (promax). Based on the scree plot, the remaining 12 values items consisted of two factors, together explaining 48.73% of the variance. The first factor, *self-transcendence*, consisted of nine items, e.g. "teamwork" ($\alpha = .81$). The second factor, *conservation*, included three items: "tradition," "humility," and "respect." The reliability of this scale was acceptable ($\alpha = .69$). In order to prevent ceiling effects, the respondents had to first pick their single most and least important values from the total list of 12 values (Bardi and Schwartz, 2003). Then, respondents rated each value on a 7-point Likert scale, ranging from 1 = "highly unimportant" to 7 = "highly important."

Information sharing – The team-members survey included an eight-item, validated "information sharing" scale (De Vries *et al.*, 2006). The scale was rephrased to the team-level ($\alpha = .92$); a sample item is: "When team members need certain knowledge, they ask their colleagues for it." All items were measured through a 7-point Likert scale ranging from 1 = "strongly disagree" to 7 = "strongly agree."

Lean-team effectiveness – Team members graded their team's overall effectiveness, including the level of continuous improvement, non-managerial employee involvement, and customer focus—three key lean principles (Morrow, 1997)—on a 5-point scale (1 = "lowest;" 5 = "highest"). A principal axis EFA with all team member data ($N = 395$) indicated one factor, that explained 67.57% of the variance ($\alpha = .75$).

Control variables – Team size, male/female ratio, service/manufacturing sector, and educational level were also assessed, because these variables are seen to impact team behaviour such as information sharing (see Aubé *et al.*, 2011; Bhamu and Sangwan, 2014; Hadid and Mansouri, 2014; Siemsen *et al.*, 2009; Wang and Noe, 2010).

Data Analysis

In order to examine whether data aggregation was justified, intra-team member agreement coefficients, ICC(1) and ICC(2), were calculated (LeBreton and Senter, 2008). Information sharing roughly met the cut-off criteria: ICC(1) = .13; ICC(2) = .66; $F = 2.64$; $p < .01$. Lean-team effectiveness had lower, but acceptable scores: ICC(1) = .07; ICC(2) = .49; $F = 2.08$; $p < .01$. These ICCs must be interpreted with caution as larger teams would have attained better scores (Shrout and Fleiss, 1979). Therefore, $r_{WG(J)}$ scores were also calculated (LeBreton and Senter, 2008). Both information sharing and lean-team effectiveness were normally skewed, leading to a $r_{WG(J)}$ score of .52 for information sharing and .61 for lean-team effectiveness. It was decided aggregation was justified.

In order to curb common-source bias, each team member's response was randomly assigned to one of two datasets (Rousseau, 1985). 1) One was used to calculate aggregate scores for information sharing. 2) The other was used to calculate aggregate scores for lean-team effectiveness. A two-tailed, paired samples T-test indicated no significant differences between the subset mean scores of information sharing ($t = -1.26$, $p = .22$) and lean-team effectiveness ($t = .71$, $p = .49$). All the aggregated variables showed high reliability and a Shapiro-Wilk test indicated a normal distribution.

In testing model fit, structural equation modeling (SEM) was conducted through AMOS with Maximum Likelihood bootstrapping. Good model fit figures are (Hu and Bentler, 1999): CFI if $> .95$; SRMR with a maximum of .08; RMSEA if $< .06$; PCLOSE if $> .05$. The hypotheses were tested with linear regression analyses, whereby the data was aggregated at the team level. Mediation was tested following Baron and Kenny's (1986) criteria, and the indirect effect of leaders' values was analysed with a Sobel test.

Results

Table 1 shows a positive significant correlation between team member information sharing and lean-team effectiveness ($r = .67$, $p < .01$), as well as a negative significant correlation between team leaders' conservation values and lean-team effectiveness ($r = -.38$, $p < .05$). There was also a marginally significant correlation between team leaders' self-transcendence values and team members' information sharing ($r = .31$, $p < .10$). A significant, positive correlation existed between team leaders' self-transcendence and conservation values ($r = .59$, $p < .01$).

SEM indicated a good fit on the model including information sharing as a mediator between team leader values and lean-team effectiveness ($\chi^2 = 6.689$, $df = 8$, $p = .571$, $CFI = 1.000$, $SRMR = .064$, $RMSEA = .000$, $PCLOSE = .613$). The fit indices are considerably better in comparison to a model without information sharing ($\chi^2 = 12.936$, $df = 10$, $p = .227$, $CFI = .945$, $SRMR = .081$, $RMSEA = .111$, $PCLOSE = .272$).

These SEM results were corroborated by two linear regression analyses (see Table 2), one with information sharing and the other with lean-team effectiveness as the dependent variable. Although leaders' self-transcendence and conservation values were highly correlated, the variance inflation factor (VIF) scores were lower than 2.14, thus showing no evidence of multicollinearity. H1 anticipated that leader self-transcendence values are positively linked to lean-team effectiveness, as shown in Table 1 ($\beta = .75$, $p < .01$). H2 proposed a negative relationship between leader conservation values and lean-team effectiveness: The data back this hypothesis ($\beta = -.81$, $p < .01$).

The hypothesised positive relation (H3) between leader self-transcendence values and team members' information sharing was supported ($\beta = .56$, $p = .05$). In testing H4, a significant, positive relationship was found between information sharing and lean-team effectiveness, when controlling for leaders' values ($\beta = .46$, $p < .05$): an important precondition. When information sharing was added to the model, the positive relation

between leader self-transcendence values and lean-team effectiveness slightly decreased, but remained significant ($\beta = .49, p < .05$), indicating partial mediation. A Sobel test supported a significant indirect effect of leaders' self-transcendence values on lean-team effectiveness, mediated by information sharing behaviour ($z = 1.77, \beta = .25, p < .05$).

H5 was also supported: The relationship between leaders' conservation values and information sharing was significantly negative ($\beta = -.49, p < .05$). On testing H6, it was established that the standardized regression coefficient of conservation was decreased. Yet, it remained significant when information sharing was added ($\beta = -.59, p < .01$), indicating partial mediation. The Sobel test showed marginally significant support for the mediation of information sharing on the relationship between leaders' conservation values and lean-team effectiveness (H6): $z = -1.57, \beta = -.22, p < .06$. The marginally significant effect shows a tendency that may be strengthened in larger-sample studies.

Table 1 – Summary of Descriptive Statistics and Zero-order Correlations

Variable	Mean	SD	1	2	3	4	5	6	7
1. Self-transcendence	5.86	.51							
2. Conservation	4.12	1.05	.59**						
3. Information Sharing	5.49	.44	.31	-.09					
4. Lean-Team Effectiveness	3.86	.33	.24	-.38*	.67**				
5. Team Size	15.56	9.20	.06	-.03	-.14	-.12			
6. Male/Female Ratio	.60	.32	-.15	-.00	-.25	-.20	-.03		
7. Service/Manufacturing Sector	1.60	.50	-.11	-.17	.15	.23	-.11	.67**	
8. Educational Level	2.23	.47	-.02	.13	.13	.02	-.10	-.29	.62**

Note. $N = 25$. Inter-correlations among the dependent and independent variables (no. 1-4) were tested one-tailed. The inter-correlations with the control variables (no. 5-8) were tested two-tailed. * $p < .05$. ** $p < .01$.

Table 2 – Linear Regression Results

Independent Variable	Team Members' Information Sharing Behaviour		Lean-Team Effectiveness		
	Step 1	Step 2	Step 1	Step 2	Step 3
Control Variables:					
Team Size	-.16	-.19	-.10	-.17	-.08
Male/Female Ratio	-.32	-.23	-.06	.00	.11
Service/Manufacturing Sector	-.14	-.20	.29	.12	.21
Educational Level	.11	.24	-.19	.06	-.05
Team Leader Values:					
Self-transcendence		.56*		.75**	.49*
Conservation		-.49*		-.81**	-.59**
Team Members' Information Sharing Behaviour					.46**
<i>Degrees of freedom</i>	20	18	20	18	17
R^2	.09	.30	.09	.54	.69
ΔR^2	.09	.21	.09	.45	.15
F	.50	1.28	.48	3.47*	5.28**

Note. There was no evidence of multicollinearity; none of the variance inflation factors (VIFs) was > 2.14 . † $p < .10$. * $p < .05$. ** $p < .01$ (one-tailed).

Discussion

Team leaders' "lean thinking" or espoused values are shown here to be associated with team members' information sharing behaviour and, in turn, with lean-team effectiveness. Specifically, this study establishes that leaders' self-transcendence values and team members' information sharing behaviour are positively related to lean-team effectiveness, whereas leaders' conservation values are negatively linked to lean-team effectiveness.

Information sharing by team members mediates in part the relation between leaders' self-transcendence values and lean-team effectiveness.

The partial mediation effect of team members' information sharing supports Hackman's point that "input factors directly and simultaneously influence *both* interaction process and performance" (Hackman, 2012, p. 432). This study adds to this insight by suggesting that lean-team leaders' value constellations spur team information sharing. Clearly, lean leaders' values are shown to matter to the behaviours of the teams they supervise. Team leaders with self-transcendence values constellations "serve as models for others" and are associated with effective lean-team dynamics (Sagiv and Schwartz, 2007, p. 183), i.e., team members seem to "read" their leaders' values constellations. The partial mediation effect may point towards the importance of other mediating behaviours, such as: conflict management, co-worker support, psychological safety, team cohesion, team goal orientation, improving work practices, and team leaders' actual behaviours (Siemsen *et al.*, 2009; Van Dun and Wilderom, 2012). Future studies of these behaviours must link them to objective measures of performance, which may help to integrate Organisational-Behaviour and Operations Management models (Bendoly *et al.*, 2010; Bendoly *et al.*, 2006; Detert *et al.*, 2000).

Practical Implications

In most lean programmes leaders and consultants start by installing tools in teams; their efforts are likely to be more effective if they also pay attention to team leaders' values and members' information sharing behaviours (Bortolotti *et al.*, 2015). Thus, in order to promote less wasteful lean work-floor interactions one should appoint leaders with predominantly self-transcendence values. Since lean-team leaders with conservation values are less likely to lead to team success, those who select such leaders may need to align their human-resource approach with a lean strategy (Van Dun and Wilderom, 2012).

Limitations and Future Research

Even though the main sample contains a total of 429 survey respondents employed by a wide variety of organisations, the sample of 25 Dutch work teams is relatively small. Although the *individual* team members' response rate was high, 82%, future lean studies need to be conducted with larger *team* samples across multiple countries (see, also, Sagiv and Schwartz, 2007). Another comparative study is recommended in which similar non-lean work teams are included: to find to what extent our findings are unique to *lean* teams.

Due to the cross-sectional design, causality could not be established. An examination of time-lagged links between leader values, their team members' behaviour and lean-team effectiveness is recommended. Future longitudinal designs might: 1) reveal how members' values and behaviours may change or consolidate over time due to their leaders' adoption of lean values constellations. 2) Examine lean leaders' personal transformation, from a conservation-oriented values set towards more self-transcendence. It might very well be that leaders struggle to reach "lean thinking" because their values are typically stable, deeply ingrained anchors, which are difficult to adjust (Jin and Rounds, 2012). Moreover, field studies could focus on how exactly lean-team information sharing takes place and how it boosts (objective) lean-team performance. They could explore: 1) The possible value of information exchange about seemingly trivial affairs between lean-team members. 2) How members balance both factual and subjective exchanges. And 3) their information donating and collecting ratios.

The positive and high inter-correlation between the "self-transcendence" and "conservation" values clusters (see Table 1) may have caused stronger links between the values and the dependent variable in the regression analysis. Yet, the VIF scores show

that multicollinearity is negligible. Indeed, the two counter-ideal values scales entail separate factors, yet they are not fully independent (Van Quaquebeke *et al.*, 2014). The present study thus points toward the need of confirmatory factor analysis. Although we examined two of Schwartz's (2012) values clusters, future studies may want to incorporate his full quartet. While humility was classified in the conservation cluster, it may fit both the "conservation" and "self-transcendence" factors (Schwartz *et al.*, 2012). In a lean context, humility should perhaps be interpreted as "a self-protecting value that is grounded in anxiety avoidance" (Schwartz *et al.*, 2012, p. 670). Considering that conservation values are associated here with lower lean-team effectiveness, it may seem that lean leaders should *not* emphasize humbleness. Lean demands people to voice their ideas for improvement and leaders may need to set this example. Intriguingly, this contrasts with the idea of humble lean leaders who give their workers room to share ideas (Bicheno and Holweg, 2009; Van Dun *et al.*, 2016). Effective lean leaders seem to paradoxically combine a strong display of vision and humility, whereby leader's humbleness has also been associated with incremental improvement (Ou *et al.*, in press; Owens and Hekman, 2012; in press). Hence, larger-scale research on the beneficial or potentially detrimental team effects of the content of leader humbleness is clearly needed.

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