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Does an adequate team climate for learning predict team effectiveness and innovation potential? A psychometric validation of the Team Climate questionnaire for Learning in an organizational context

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Abstract

This paper reports the application and psychometric validation of a multi-dimensional measure of team climate for learning in a multinational organization. The research project aimed at extending previous findings at Aston Business School, using the English 33-item version of Brodbeck's Team Climate questionnaire for learning to assess the factors that facilitate team learning in a business context and analyse its relationship to group performance, support for innovation and different effectiveness criteria chosen by the organization we cooperated with. Data concerning the TCL, the level of group development as a related process, and measures of group performance, innovation and effectiveness were gathered from 119 participants belonging to 18 work groups of the organization's headquarters and three subsidiaries in Germany, Switzerland and Belgium. The undertaken studies were carried out using a cross-sectional and correlated design. The assessment tool proved to have good psychometric properties, providing an adequate reliability, validity and power of prediction regarding team performance ($R^2 = .81$), support for innovation ($R^2 = .69$) and team effectiveness (e.g. $R^2 = .59$ as regards to the keeping of deadlines). Potential benefits derived from the application of the presented measure, limitations of the current research project and future perspectives are discussed.

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1. Introduction

Many recent studies prove that teams are becoming increasingly embedded in organizational structures (Ambrose & Kulik, 1999; Mathieu, Marks & Zaccaro, 2001; Kozlowski & Ilgen, 2006). Environments are steadily becoming more complex, fast moving and dynamic (Thornton, Hollenbeck & Johnson, 2009), forcing the organization to meet several different challenges, such as a raised ambiguity and unpredictability, an increasing competition and growing time pressure (Navarro, Quijano, Berger & Meneses, 2011). These challenges compel organizations to change their structure (Ramezan, 2011) and switch from a traditional mechanistic perspective, with a high level of rigidity to a

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more organic one, promoting flexibility (Lawler & Worley, 2006; Grant, Fried, Parker & Frese, 2010). This eventually demands a shift from vertical decision-making activities to horizontal collaboration and, from individual jobs in functionalized structures to cross-functional teams embedded in highly complex and dynamic workflow systems (Ramezan, 2011). In this sense, teams promote adaptability, flexibility and creativity, they are capable of achieving high performances regarding complex, ambiguous and interdependent tasks, and facilitate multiple and quick decision making processes (Kozlowski, Gully, Nason & Smith, 1999; Salas, Cooke & Rosen, 2008; West, 2008; Richardson & West, 2010; Alcover, Rico & Gil, 2011). As a consequence, work groups are supposed to be highly effective learning systems, favouring and boosting an organization's competitiveness (Critchley & Casey, 1996; Coff, 2003; West & Markiewicz, 2004).

The importance of team climates conducive to learning

Not all groups are able to obtain good results (Rufus, 1998; Gómez-Mejía, Balkin & Cardy, 2001; Fransen, Kirschner & Erkens, 2011). According to Hackman (1987), a team can be considered as efficient and successful if its productive output meets or even exceeds the performance standards of its clients, if it enhances the capability of its members to work together on subsequent team tasks, and if the individual experience of being part of the group satisfies the personal needs of each member. Considering further criteria for effectiveness, it should be pointed out that a high-performing team is one that stands out because of possessing the potential to set the company on a path to new innovations (Brodbeck, 2003, 2010; Pfaff & Huddleston, 2010; Calantone, Cuvusgil & Zhao, 2002; Storey & Kelly, 2002; Tsai, 2008; Kamasak & Bulutlar, 2010).

Although the importance of learning behaviours with regard to enhanced performance and innovation potential has been stressed in previous studies (Brodbeck, 1996; Birkinshaw & Mol, 2006), research on factors that facilitate team learning in an organizational context has been unjustly neglected, ignoring the fact that learning in companies mostly takes place in work groups (Edmondson, 2002). Therefore, any organization should strive to find out and encourage the factors that make learning and knowledge transfer more efficient and thereby improve its performance and innovation in the long-term. Doing so, it has to be kept in mind that the concept of team learning takes a multilevel perspective, considering individuals, the team and other organizational aspects, and their interplay over time (Kozlowski & Bell, 2008). Correspondingly, there are several conditions that influence the learning processes within work groups, with group-climate being a very important one (Schneider, Bowen, Ehrhart & Holcombe, 2000; Brodbeck, 2010).

A team climate for learning has been defined as shared individual perceptions of work settings among members of a team or an organization that promote or hinder learning in the workplace (Nixon, 1991; James, Choi, Ko, McNeil, Minton & Wright, 2008; Brodbeck, 2003, 2010). Following Brodbeck (2003, 2010), it is characterized as one in which: (1) There is empathy, camaraderie, support as well as a common understanding among its members, conveying an atmosphere of mutual trust, (2) There is a regular contact as well as an informal and formal communication among its members, (3) There exists a common agreement with the goals and objectives to be achieved, and these shared goals are clear, realistic and really achievable, (4) There is a prevailing notion of democracy and equality among its members, with no one having particular dominion over the others, (5) Members perceive a kind of individual development as the group enhances their creativity and provides them with useful ideas and general support in fulfilling their plans.

As Brodbeck (2002) managed to show in an academic context, a good team climate for learning predicts both individual and group level outcomes. Therefore, it becomes clear that climates conducive to learning are definitely a fruitful field of future research and should also be studied in organizational settings.

3. Method

The main objective of the study was to validate and deliver a cost effective measurement of learning processes in work groups. The relationship between team learning, group performance, effectiveness and support for innovation has been assessed, looking for results that enable the management and the teams to identify factors facilitating a climate conducive to learning and to develop effective strategies for enhancing desirable behaviours.

3.1. Survey procedure and sample

To analyse the team climate for learning, we collaborated with the Spanish car manufacturer SEAT, S.A., with headquarters in Martorell (Barcelona), employing more than 14,000 professionals. The company has its own Technical Center with more than 900 engineers responsible for innovation. The study includes data from 6 work groups from the headquarters in Martorell, 6 teams belonging to its subsidiary in Germany, 4 work groups from its subsidiary in Switzerland and 2 teams situated in Belgium, reaching a total sample of 18 work groups comprising of 119 participants of which 54.6% were female. The considered groups had an average size of 5.24 members ($SD = .54$; range: 4 to 10) and were composed by white-collar workers with an average of 3.44 years of group membership ($SD = .50$; range: 1.06 to 8.56). The teams were asked personally by a researcher to complete a paper-pencil questionnaire that took approximately 15 minutes. After the participation the teams and management were provided with written feedback.

3.2. Instruments

Striving to assess the prevailing team climate for learning, the English 33-item version of the Team Climate questionnaire for Learning (TCL) (Brodbeck, Guillaume and Winkler, 2010) was administered to all of the aforementioned work groups. Each item had to be rated on a 7-point Likert-type scale (1 = strongly disagree, 2 = mostly disagree, 3 = slightly disagree, 4 = uncertain, 5 = slightly agree, 6 = mostly agree, 7 = strongly agree). The 33 items have been shown to reflect 9 dimensions, referring to 1. Mutual Trust (enclosing the items 12, 19, 25, 32), 2. Goal Alignment (items 16, 18, 21, 22, 26, 30), 3. Attendance (items 2 & 5), 4. Regular Contact (items 1, 6, 13, 28), 5. Democracy (enclosing the items 9 & 15), 6. Team Management (items 10, 11, 17, 24), 7. Individual Development (enclosing the items 3, 4, 27, 31), 8. Open Exchange (items 8, 23, 29) and 9. Motivation and Interest (items 7, 14, 20, 33).

Following Brodbeck et al. (2010), two additional items were introduced in order to provide a subjective criterion variable for supporting the validation process of the TCL. One of the items asked the subjects to rate the overall climate for learning in their respective work group, and the other item asked for their individually experienced benefit of being a member of their team for their individual learning progress. These two items were to be rated on a 10-point Likert-type response scale, ranging from 1 (very low) to 10 (very high).

Cronbach's α of the questionnaire's nine subscales ranged from .71 to .88 and the reliability of the TCL Global Score was $\alpha = .85$ (Brodbeck, 2010), all results reaching the commonly agreed value of .70, indicating a sufficient level of internal consistency (Pospeschill, 2006).

As well as the above-mentioned measures of the TCL, we also applied a 12-item tool in order to assess group performance, showing an adequate reliability of $\alpha = .758$. The questionnaire was based on Hackman (1987) and had a Likert-type response scale ranging from 1 (strongly disagree) to 5 (strongly agree), measuring the maintenance of the group, the satisfaction of the group members' needs and the outputs achieved by the group, reflecting the three assessment criteria that Hackman considered to be characteristic and indispensable for a good team performance.

In addition, the work groups' "support for innovation" was also analysed, having introduced 8 items of the "Team Climate questionnaire for Innovation" by Anderson & West (1998). This dimension was shown to have an α coefficient of .92 and to be a significant predictor of overall innovation and innovation novelty, accounting for 46% of the variance.

In order to provide the multinational organization the opportunity to take full advantage of the study and to analyse whether the prevailing team climate for learning had a significant effect on outcomes that were internally considered as important variables for the organization's productivity and success, 4 items were incorporated,

Table 1
Means, Standard Deviations, Correlations and α -Reliabilities of the TCL (individual-level)

Factor	M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Mutual Trust	4.93	1.31	(.90)									
2. Goal Alignment	5.18	1.06	.70**	(.87)								
3. Open Exchange	5.50	1.01	.78**	.68**	(.81)							
4. Support for Individual Learning	4.76	1.39	.72**	.80**	.73**	(.89)						
5. Regular Contact	5.26	1.34	.75**	.83**	.76**	.81**	(.87)					
6. Motivation and Interest	5.10	1.32	.85**	.81**	.74**	.78**	.85**	(.93)				
7. Team Management	4.63	1.27	.71**	.71**	.66**	.67**	.67**	.74**	(.79)			
8. Democracy	4.24	1.57	.30**	.10	.23*	.10	.12	.25**	.25**	(.80)		
9. Attendance	4.96	1.93	.55**	.48**	.47**	.39**	.50**	.56**	.41**	.35**	(.94)	
10. TCL Global Score	4.99	1.07	.90**	.89**	.84**	.87**	.89**	.93**	.83**	.28**	.64**	(.91)

Note: $N_{\text{individuals}} = 119$; $N_{\text{groups}} = 18$. Figures in parentheses represent α -reliabilities.

* $p < .05$; ** $p < .01$ (two-tailed).

reflecting effectiveness criteria that were chosen and furnished by the organization itself. These indicators included the keeping of deadlines, the striving for high-quality results, the overall satisfaction with the current job, and the assuring of a continuous flow of information between all team members.

To assess the convergent validity of the TCL, we ultimately included 8 items evaluating the “level of group development” (LGD), a measure that is not only linked to the performance of work groups but has also been proved to be related to a climate conducive to learning (Bartra, 2011). This tool was conceived by Navarro, Meneses, Miralles & Moreno (n.d.) and was shown to have a Cronbach’s alfa of .852.

3.3. Statistical analysis

In line with our objectives, we conducted a total of four studies (using PASW 18) to assess the validity of the instrument within an organizational context and to measure its impact on group performance, support for innovation and the effectiveness criteria selected by the organization.

To initiate the validation process of the 33-item pool, the inter-item reliability or internal consistency of the TCL questionnaire was assessed, referring to the degree of item coherence regarding its scale and the different observations that have been used to derive a score (Pospeschill, 2006).

We also strived to evaluate the convergent validity of our questionnaire. Using group-level data, we assessed the relationship between the different measures of the TCL and the global score of the teams’ “LGD”, a construct that team learning should be highly related to.

For supporting the validation process of the TCL, two subjective criterion measures were assessed further. Through item 34, asking the subjects to rate their team’s climate for learning, we evaluated if the results measured by the psychometric instrument corresponded with the persons’ overall appraisal regarding the learning capacities within their work groups. To prove if it is true that a positive group-to-individual learning transfer takes place in a favourable team climate for learning (Laughlin & Jaccard, 1975), the scores of item 35 were used to evaluate to what extent the nine sub-factors and the global score of the TCL predict the employees’ perceptions of the amount of their individual learning profit from working in their respective team. Given the fact that the aforementioned variables are both assessed on an individual level, whereas team climate is a typical group level variable, multilevel regression analyses were employed to assess the criterion validity of the TCL (Pospeschill, 2006). The two subjective variables were regressed on each of the nine factors as well as on the TCL total score entered as group level variables.

In the fourth study simple regressions were further used to analyse the ability of the TCL to predict group performance, support for innovation and different effectiveness criteria assessed at team level (flow of information, motivation to achieve high-quality standards, satisfaction with current job, keeping of deadlines). Doing so, we attempted to show to which extent the measure distinguishes between groups that do well regarding these criterions versus those that do not. Calculating the instrument’s criterion validity, we considered both the influence of the nine sub-factors and the impact of the TCL’s global score.

4. Results

Table 1 shows good results for the internal consistency of the nine sub-factors and the TCL global score (ranging from .79 to .94), suggesting that all items loading on a factor are likely to measure the same construct.

When comparing the results of this industrial sample with Brodbeck's sample of students, the α -reliabilities of both the subscales and the global score are very similar, with the university sample showing Cronbach's α ranging from .71 to .88.

Moving on to study 2, and considering the results (table 2) of the conducted Pearson correlation analyses, it can be concluded that the TCL scale shows a good convergent validity with respect to the global score of the level of group development. The observed correlation coefficients were high (above .82), excluding the factors democracy (.18) and attendance (.45) that only showed a poor and not significant correlation.

Table 2
Convergent validity (at group level)

Factor	Scale LGD
1. Mutual Trust	.91**
2. Goal Alignment	.84**
3. Open Exchange	.92**
4. Support for Ind. Learning	.87**
5. Regular Contact	.82**
6. Motivation and Interest	.85**
7. Team Management	.83**
8. Democracy	.18
9. Attendance	.45
10. TCL Global Score	.91**

Note. $N_{\text{individuals}} = 119$; $N_{\text{groups}} = 18$.
* $p < .05$; ** $p < .01$ (two-tailed).

Scale LGD = Total Score of Level of Group Development

In order to assure that the studied constructs are not redundant and different from one another, the current analysis should possibly be complemented by an additional confirmatory factor analysis that would increase the importance of the found convergent validity.

Regarding the criterion validity, study 3 proves that the TCL measures correspond with the individuals' appraisal of the prevailing learning climate within their work groups and predict the subjects' perception about how much they benefit from being part of their team when it comes to their individual learning progress and profit, showing that a climate conducive to learning favors a positive group-to-individual learning transfer.

Table 3
Criterion validity (at individual level), R squares of TCL Factors and Total Score, individual appraisal and individual benefit of learning climate

Factor	Scale 1	Scale 2
1. Mutual Trust	.86**	.73**
2. Goal Alignment	.75**	.83**
3. Open Exchange	.69**	.63**
4. Support for Ind. Learning	.70**	.66**
5. Regular Contact	.81**	.82**
6. Motivation and Interest	.89**	.86**
7. Team Management	.65**	.72**
8. Democracy	.01	.01
9. Attendance	.29*	.48**
10. TCL Global Score	.87**	.87**

Note. $N_{\text{individuals}} = 119$; $N_{\text{groups}} = 18$.
* $p < .05$; ** $p < .01$ (two-tailed).

Scale 1 = individual appraisal of learning climate

Scale 2 = individual benefit of learning climate

Apart from the individual-level criterion validation, the results of study 4 and 5 clearly show that the TCL has a good predictive ability with respect to group performance, support for innovation and the effectiveness criteria chosen by the organization. When talking about these group-level variables, it should, despite the significant results, nevertheless be noted that our current sample size of 18 work groups must clearly be increased in order to fulfil the statistical prerequisites of all the undertaken analyses.

Table 4
Criterion validity (at group level), R squares of TCL Factors and Total Score, group performance and support for innovation

Factor	Scale 1	Scale 2
1. Mutual Trust	.78**	.43**
2. Goal Alignment	.69**	.74**
3. Open Exchange	.82**	.47**
4. Support for Ind. Learning	.84**	.80**
5. Regular Contact	.73**	.64**
6. Motivation and Interest	.69**	.58**
7. Team Management	.65**	.45**
8. Democracy	.02	.02
9. Attendance	.18	.32*
10. TCL Global Score	.81**	.69**

Note. $N_{\text{individuals}} = 119$; $N_{\text{groups}} = 18$.

* $p < .05$; ** $p < .01$ (two-tailed).

Scale 1 = Total Score of Group Performance

Scale 2 = Total Score of Support for Innovation

Table 5
Predictive validity (at group level), R squares of TCL Factors and Total Score and effectiveness criteria

Factor	Scale 1	Scale 2	Scale 3	Scale 4
1. Mutual Trust	.46**	.62**	.73**	.42**
2. Goal Alignment	.69**	.66**	.75**	.62**
3. Open Exchange	.51**	.68**	.78**	.37**
4. Support for Ind. Learning	.76**	.85**	.90**	.61**
5. Regular Contact	.74**	.74**	.81**	.66**
6. Motivation and Interest	.53**	.67**	.74**	.55**
7. Team Management	.49**	.39**	.63**	.25*
8. Democracy	.00	.00	.00	.01
9. Attendance	.23*	.16	.27*	.33*
10. TCL Global Score	.66**	.71**	.84**	.59**

Note. $N_{\text{individuals}} = 119$; $N_{\text{groups}} = 18$.

* $p < .05$; ** $p < .01$ (two-tailed).

Scale 1 = flow of information

Scale 2 = high-quality standards

Scale 3 = satisfaction with current job

Scale 4 = keeping of deadlines

5. Discussion

This research shows that the TCL should be of interest to all group leaders, managers and organizations that strive to achieve a sustainable competitive advantage. For being successful in the long-term, work groups need to have the most favourable conditions for effective and efficient learning and knowledge sharing, being vital for the achievement of high-quality results and surviving in steadily changing business contexts (Brodbeck, 1996; Edmonson, 1999 & 2002; Kozlowski & Bell, 2008). In this regard, the TCL offers managers the opportunity to assess the prevailing learning climate and the quality of knowledge-transfer within their teams, providing them with useful information to improve the current learning processes. Furthermore, a team climate conducive to learning has been proved to be a significant predictor of group performance, support for innovation and team effectiveness. As a consequence, gaining information on the climate for learning enables the management to develop effective strategies that enhance the knowledge sharing in teams and have beneficial effects on innovation and effective performances.

For future research it is planned to extend the sample, enlarging it to at least 30 teams. Doing so, both the individual and the group-level analysis will become more meaningful. The analysed data set exclusively referred to teams showing a relatively stable composition of people. Therefore, the findings cannot be extrapolated to project teams in which the group members only work together for a short period of time. The design used in our undertaken studies was exclusively cross-sectional. In order to assess the test-retest reliability of the TCL, it would be necessary to use a longitudinal design. Although correlation between the nine 9 sub-factors are expected since they are not mutually exclusive and can, therefore, affect each other, we must state, that the inter-correlations we found are

partly very high, so that it cannot be entirely excluded that the nine subscales may be due to a second order factor. Therefore a confirmatory factor analysis should definitely be undertaken. In terms of discriminant validity, an adequate scale has to be found that is regarded and can be proved to measure a distinct construct from team learning. Future research should additionally try to focus on objective criterion measures for the group-level validation.

Summarizing, the paper presents an empirically supported tool that is able to predict effectiveness and performance criteria that are crucial for the long-lasting and outstanding success of a company. Apart from being time-effective, it has to be emphasized that there is no training needed to apply the instrument or to interpret its results.

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