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Climate for Personal Initiative and Radical and Incremental Innovation in Firms: A Validation Study

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We examine whether organizational climate for personal initiative (PI climate) is conducive to firm innovation in small and medium-sized firms. Employees with PI are self-starting, proactive, and persistent, and a PI climate is characterized by common norms of encouraging PI at the workplace. A climate that fosters PI among employees would enhance the innovation output of firms, since it increases not only proactive thinking about future opportunities and problems but self-starting action as well. This PI climate is distinct from the team climate inventory (TCI, Anderson and West, 1996). We contrast the PI climate measure (Baer and Frese, 2003) with the TCI for predicting radical and incremental innovations in firms. Findings reveal (with 25 firms, \( N = 82 \) employees) that PI climate was related to radical innovation, but not incremental innovation. On the other hand, the TCI (unrelated to radical innovation) was related to incremental innovation. Our study results imply that different organizational climates account for the different forms of innovation in firms.

Keywords: Organizational climate; climate for personal initiative; team climate for innovation; radical and incremental innovation; IT firms.
INTRODUCTION

Innovation is of high importance for society and companies. Western governments, for example in the European Union (European Commission, 2013a,b), have introduced innovation initiatives. Most countries attempt to increase the innovativeness of their universities, research institutes, cities, and companies. The argument is that only by increasing the speed and levels of innovations will Western countries be able to compete with low-income countries and still keep up their high wages. For companies, innovation is paramount because they will fall behind their competition if they do not introduce new products, services, and processes (Rosenbusch et al., 2011)—there is also meta-analytic evidence for a relationship between firm innovativeness and firm performance (Rosenbusch et al., 2011; Szymanski et al., 2007). Theoretically, innovations are interesting because they imply that something new has been thought, done, or introduced by individuals, teams, companies, or societies that had not been thought, done, or introduced before.

Climate factors are important predictors of innovation at the team level. A meta-analysis showed the relationships of climate factors with team innovativeness to be $r = 0.30$ and higher (Hülsheger et al., 2009). In general, there is more research on team or organizational climate for innovation which focuses on interindividual or inter-team differences (e.g. Charbonnier-Voirin et al., 2010), than there is on organizational climate for innovation which focuses on differences between organizations (e.g. Patterson et al., 2005). Therefore, reviews of innovation research have called for more firm-level studies in this domain (Anderson et al., 2004; West and Richter, 2008).

However, whether relevant team innovation concepts may be transferred to the firm level should be subject to debate because innovation at the team and at the firm level may differ in terms of constraints and actions needed for success. We shall argue, in this article, that it is possible to convey the relevant research on innovation in teams to the organizational level. This may be even more possible in small and medium-sized firms, in which the climate of a whole organization may support or restrict innovation, whereas in larger organizations innovation may be confined to pockets, teams, or divisions. Our first goal is to answer the question of how climate factors are related to innovation in small and medium-sized firms.

To do this, we use a relatively new climate concept: climate for personal initiative (PI climate; Baer and Frese, 2003; Michaelis et al., 2010). PI
climate is defined by self-starting organizational development activities, including the proactive search for both future opportunities and problems, and the preparation to overcome barriers (Frese and Fay, 2001; Frese et al., 1997). The construct, developed to describe a climate that fosters personal initiative among employees, has already been used to predict profitability of firms. In the study by Baer and Frese (2003), PI climate strengthened the relationship between the introduction of process innovations and organizational success. Seeking to add to this literature, we now examine the relevance of PI climate for predicting innovation in the first place. Here, we suggest that the PI climate will predict innovation, because individual personal initiative has been shown to be related to idea generation (Binnewies et al., 2007), entrepreneurial success (Glaub et al., 2012), and innovation implementation behavior (Michaelis et al., 2010). However, empirical work on PI climate has not been done at an aggregate level with regard to innovations in firms (Baer and Frese examined only process innovations and organizational success). Therefore, the second goal of this study is to test the hypothesis that PI climate is related to innovations in firm.

Innovations, however, are difficult to capture within one concept (Dewar and Dutton, 1986). On the one hand, innovators introduce radical innovations, which impact the lives of many people. These innovations are disruptive as they, in the process of introducing something new, make an existing knowledge base obsolete (Subramaniam and Youndt, 2005). An example is the invention of the computer for statistical calculation. Computers allowed researchers to calculate results using complex algorithms without knowing the algorithm, thereby making previous methods of calculation per hand superfluous. On the other hand, incremental, small-scale innovations occur in businesses all the time (Kirzner, 1997), for instance, when individuals adopt existing knowledge to fit new problems. Thereby, the usefulness of existing knowledge is reinforced (Subramaniam and Youndt, 2005). We suggest that the different kinds of organizational climates impact these different forms of innovation selectively. Therefore, the third goal of this study is to test whether different organizational climates predict the introduction of radical or incremental innovations in firms.

Whenever concepts as new as the PI climate are introduced in any domain of psychology, these should explain additional variance in a relevant dependent variable in comparison to the preexisting concepts. In the present analysis, the team climate inventory (TCI) (Andersen and West, 1998; Patterson et al., 2005) is of major importance because it has been shown to predict innovativeness (Hülsheger et al., 2009). We are interested in
empirically determining whether the PI climate explains more of the variance in the introduction of radical or incremental innovations in firms than the TCI alone. Thus, the fourth goal is to demonstrate incremental validity of a PI climate for a firm’s innovation output.

Before introducing the study, we first discuss the concept of innovation, then we consider how culture and climate are related to innovation, and finally, we elaborate on the theoretical significance of the PI climate.

The Concepts of Radical and Incremental Innovation

In our research, we adopt West and Farr (1990, p. 9) definition of innovation: “Innovation is the intentional introduction and application within a role, group or organization of ideas, processes or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organization, or wider society.” To remain competitive it is imperative that organizations achieve different kinds of innovations (Dewar and Dutton, 1986; Subramaniam and Youndt, 2005; Gibson and Birkinshaw, 2004). Romijn and Albaladejo (2002) differentiated incremental innovations from radical innovations by using the scientific nature of the innovation and the degree of novelty as indicators. Radical innovations are characterized by a high scientific influence along with a high degree of novelty, whereas incremental innovations are characterized by a low scientific influence and low novelty. A low scientific influence implies that the product can be improved with little technological effort (Romijn and Albaladejo, 2002). The degree of novelty of an innovation is related to the similarity of a product to other products. Is a product similar to other ones within the market or within the company? Has the idea been taken from another industry or is it something that has not been done before? (Romijn and Albaladejo, 2002).

We are interested in both incremental and radical innovations. Following Subramaniam and Youndt (2005), we define incremental innovation as “innovations that refine and reinforce existing products and services” (p. 452). In other words, incremental innovations are a way by which a company can adapt to changes in the market by generating a certain number of innovations to move with it. In contrast, with radical innovations, businesses change the way a market is behaving (Subramaniam and Youndt, 2005). Camison-Zomoza et al. (2004) have pointed out that “radical innovation gives rise to fundamental changes in the activities of an organization or industry with respect to current practices. It poses new
questions, develops new technical and commercial skills, and new ways of resolving problems.” (p. 336). We suggest that the success of an organization in either incremental or radical innovation is influenced by the way an organization approaches innovation. Radical and incremental innovation on the firm level should be enhanced by distinct climate factors.

Climate Factors as Predictors of Innovation of Firms

Climate factors have been shown to be important for innovation in teams (Anderson and West, 1996, 1998; West, 2002). One of the most successful sets of climate predictor variables of innovation in teams, the TCI, consists of four facets suggested by Anderson and West (1996, 1998): task orientation, participative safety, support for innovation, and vision. Task orientation implies that there is a concern for the quality of task performance. Participative safety implies that there is an atmosphere of non-threatening trust and support, so that members “are able to propose new ideas and problem solutions in a non-judgmental climate” (Anderson and West, 1998, p. 240). Support for innovation implies that there is both strong practical support for introducing new ideas and strong approval of the new ideas. Vision means that there is a clear vision with an attainable and valued outcome (Anderson and West, 1998). These four factors have been shown to be useful predictors in a number of international studies (Anderson and West, 1996, 1998; Agrell and Gustafson, 1994; Brodbeck et al., 2000).

We apply the team constructs to the firm level by specifically relating the firm level constructs to innovation in small and medium-sized firms. Whether or not a concept of climate or culture can be transposed from the team level to the firm level should not be taken lightly (Klein et al., 1994). Teams are more cohesive than firms. Even small companies may have different departments or a clear differentiation between those employees who work primarily operationally and those who are charged with the development of new ideas and products. Additionally, firms utilize more formal systems of communication than teams (they may also use formal systems to evaluate innovations). On the firm level, an innovation is what the firm has formally decided to bring into the market. In contrast, team-level innovations are input variables into the innovation system of a firm. Through its formal process of authority, the firm makes the final decision about whether an innovative product is pushed into the market (the latter often implies a high degree of risk and a high investment of resources). For example, risk assessment and the need for resources may be more important
at the firm level than at the team level. Thus, there are potentially different processes responsible for innovation outcomes at the firm and at the team level. However, in firms, cooperating in innovation processes as if one were a team may increase innovation because individuals with diverse specializations work together on one project. Therefore, it is useful to examine whether existing team-level constructs also apply to the firm level.

**PI Climate and TCI**

We suggest that PI climate predicts organizational radical innovation. PI climate is defined as a climate that “refers to formal and informal organizational practices and procedures guiding and supporting a proactive, self-starting, and persistent approach toward work” (Baer and Frese, 2003, p. 48). This definition implies that people do something actively — people are encouraged to do things on their own when they have new ideas. Thus, initiative should help to produce a lot of new ideas (Binnewies et al., 2007; Frese et al., 1999) and should also be important for idea implementation. A high PI climate produces a high degree of momentum within a company, which helps to put uncommon or radical innovations into effect, to overcome potential resistance against new ideas within the company, and to push the innovation into the market. Consequently, it is highly likely that there is a direct effect of PI climate on the degree of developing radical innovative ideas and making them successful within and for a company.

Applied to the firm level, conceptual differences between the PI climate and the TCI exist. Most importantly, the PI climate guides and supports active behaviors in the development and implementation of new ideas (Frese and Fay, 2001) while this may not be the case for the TCI. Active behaviors are goal oriented actions, performed in order to change the environment (Frese and Zapf, 1994; Frese and Fay, 2001). The PI climate and the TCI both include active behaviors in developing new ideas, but the PI climate goes beyond that by including active behaviors for implementing ideas (Glaub et al., 2012). Consistent with this thought, the items of the TCI are related primarily to the creativity phase of the innovation process which is very useful for innovation in teams (after all, it is their task to come up with new ideas), while PI climate emphasizes also the implementation phase (for a discussion on the phases of creativity and implementation, cf. West, 2002; Farr et al., 2003). This focus on implementation is very useful for small businesses that need to put a great deal of effort into implementation to become successful. Therefore, PI climate could help to explain radical innovation over and above the TCI.
We think that this effect of PI climate on radical innovation goes beyond the effect of TCI, despite some theoretical overlap. The most substantial theoretical overlap exists for the TCI sub-construct “support for innovation”. Support for innovation implies that the development of new ideas is encouraged — something that is common to both PI climate and TCI’s support for innovation. However, PI climate goes beyond TCI, because a PI climate encourages employees to radically challenge the firms’ current operations. Therefore, companies fostering a PI climate encourage their employees to not only take on responsibility and to do things on their own when they have new ideas, but to also take initiative and act to put the new ideas in effect whereas support for innovation, in contrast, focuses primarily on willingness and readiness to change. This willingness to change is particularly important in small businesses to increase flexibility of current products and make incremental innovation work. There are additional overlaps between PI climate and the TCI. Concern for high quality (i.e., task orientation) and vision (i.e., setting high goals and objectives for company tasks) may be prerequisites for showing a high degree of initiative and thus, should correlate. Of course, the above comments also suggest a sizeable relationship between PI climate and the construct of team climate.

After considering the aspects mentioned above, three hypotheses can be delineated:

(1) PI climate is related to radical innovation, but not to incremental innovation.
(2) PI climate is related to the TCI.
(3) The TCI is related to incremental innovation, but not radical innovation.

METHODS

Sample

In this project our focus is on small software organizations — organizations that typically operate in a different manner to larger companies (Richardson and von Wangeheim, 2007). Specifically, we sampled small and medium-sized information technology firms (and, in one case, also the IT department of a larger company) in one federal state (Bundesland) in Germany (Hessia). To acquire the sample, we used the yellow pages of the local telephone book and we contacted participants who had been recently received recognition for innovativeness in the software sector. IT companies were targeted because of the dynamic environment in which these
companies operate. This environment makes constant incremental innovation necessary, but also rewards radical innovations. However, IT firms are usually small. Therefore, we contacted 541 firms via e-mail to solicit the participation of firms with more than 3 employees. Experience has shown that whenever researchers require several participants from one firm, the response rate is rather low and, in our case, an exact calculation of the actual participation rate was not possible because we had no way of recording how many of the contacted firms were no longer in existence or were too small to participate because they had less than 3 employees. Overall, the response rate of all invitations is low, with approximately 5% of contacted firms responding. Specifically, 25 firms sent back completed questionnaires from between 2 and 9 employees (we included all firms for which two or more employees participated). Thus, data for the analyses stem from the datasets of a total of $N = 82$ employees. The sample characteristics are described in Table 1. Typical for technical occupations, there are many more males than females in the sample, and the firms had, on average, 77 employees. Mean age of the companies were 15 years.

### Aggregation Across Organizational Levels

All climate items in the questionnaire referred to the organizational level; thus, we used a referent shift consensus model (Chan, 1998). Agreement of all participants were assessed using the intraclass correlations (ICCs; with

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Table 1. Sample Characteristics.

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<tr>
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<tr>
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<td>Participants</td>
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<td>Females</td>
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<tr>
<td>Males</td>
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<th></th>
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<tbody>
<tr>
<td>Age</td>
<td>15.26</td>
<td>19.71</td>
</tr>
<tr>
<td>Number of Employees</td>
<td>106.50</td>
<td>421.06</td>
</tr>
<tr>
<td>% of Females</td>
<td>18.41</td>
<td>11.21</td>
</tr>
<tr>
<td>No. of Hierarchical Levels in Company</td>
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<td>0.09</td>
</tr>
<tr>
<td>Years in Company</td>
<td>2.68</td>
<td>1.27</td>
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</table>
the formula used by Hofmann and Mark, 2006) and the reliability within groups (RWG(j); LeBreton et al., 2005). For interpretation, the ICC(1) value should be larger than 0.12, the ICC(2) value larger than 0.7, and the RWG(j) value larger than 0.7 (Dunlap et al., 2003; Klein and Kozlowski, 2000; LeBreton et al., 2005). In the analyses, the ICC(1), ICC(2), and RWG(j) values, calculated using all participants in the sample, were higher than required; therefore, we were able to use aggregated scales.

To reduce the danger of common method biases, we split up the sample for the regression analyses in the following way: All innovation measures (radical and incremental innovation) were taken from the highest ranking person in the organization who responded to the questionnaire. We used the highest ranking person in the sample because managers have a better overview of the new ideas and products/services that exist in the company. To determine the rank, we asked for management position (yes/no) and, if yes, for the number of hierarchical layers below that person. In all but two organizations this yielded clear results. In the two remaining organizations we used random numbers (http://www.randomizer.org/form.htm) to determine the one person whose data would be used for the measurement of the dependent variables. Incremental innovation and radical innovation as rated by the highest ranked person in the organization were the dependent variables.

The independent variables (organizational climate variables) were aggregated across the remaining participants from each firm. For companies where only two members returned the questionnaire (N = 4), we used the response of the other (lower ranking) person for the organizational climate measures; for all other companies, the measures were aggregated across all lower ranking persons. The lower ranking persons should have a better overview of the climate and culture of an organization. (For a robustness test, we also calculated the regression analyses aggregating across all participants’ ratings for the dependent and independent variables.)

**Measures**

The questionnaires included measures of climate/culture and radical and incremental innovation. All items taken from English language instruments were translated and back-translated, and all items were adapted to our context (by applying the organizational context as the referent).

*Innovation measures:* Measuring innovation is difficult. This may be one reason why more studies on innovation outputs have been conducted on the
team level. Innovation of teams can be operationalized by utilizing expert ratings of the ideas developed by the teams. In contrast, the innovation of a firm is usually based on the new products or new services that are advanced and tested in the market. Any measurement of innovation of a firm is difficult because it implies that an innovation is (successfully) introduced into the market. Also using only expert ratings of the innovation and radicalism of firm innovations is unreliable because no adequate metric exists that allows the comparison between innovations across companies. Therefore, we chose to utilize a questionnaire approach to measure innovations.

Incremental innovation: We based our index of incremental innovation on validated questionnaire items that were adapted from various studies on innovation (Cambridge Small Business Research Centre, 2001; Cosh et al., 2002; Romijn and Albaladejo, 2002). All items are in line with our definition of incremental innovation ("the capability to generate innovations that refine and reinforce existing products and services." Subramaniam and Youndt, 2005, p. 452). The incremental innovation index comprises the following items which are listed in the following along with their response options:

(1) “Product innovation is a good or service, which is either new or significantly improved with respect to quality, user friendliness, or functionality. The innovation should be new to your firm; it does not necessarily need to be new to the market. Changes of a solely aesthetical nature, and the marketing of innovations entirely developed and produced by other firms should not be included. (1a) Introduction of new products following this definition in the period of 2005–2006 (no = 1; yes = 2); (1b) introduction of new service following this definition in the period of 2005–2006 (no = 1; yes = 2; slightly adapted from Cosh et al., 2002)."

(2) “Process innovation includes new and significantly improved methods of production and of procurement of products. The innovation should be new to your firm; although not necessarily new to the market. (2a) Changes of only the organizational and leadership levels should not be included. Introduction of new processes following this definition in the period of 2005–2006” (no = 1; yes = 2; adapted from Cosh et al., 2002)."

(3) “We would like you to tell us about innovations in your company. How many innovations has your firm introduced during the last 2 years?” (3a) Was there any innovation at all (no = 1; yes = 2) and (3b) number of introduced innovations. (Adapted from Cosh et al., 2002)."
Radical innovation: Scores on the following six questions were used to measure the most radical innovation that appeared in the company (scores of 0 to 5, see detailed description below) (slightly adapted from Romijn and Albaladejo, 2002), according to our definition of radical innovation (“Radical innovation gives rise to fundamental changes in the activities of an organization or industry with respect to current practices. It poses new questions, develops new technical and commercial skills, and new ways of resolving problems.” Camison-Zomoza et al., 2004, p. 336): “(a) No major innovation at all” (score of 0), “(b) same or very similar innovation adopted by competitors” (score of 1), “(c) similar innovation to the ones adopted by other firms in the same industry but the firm’s innovation differs in identifiable ways from innovations of other firms.” (score of 2), “(d) similar innovation to the ones adopted in other industries” (score of 3), “(e) innovation fundamentally new to the firm” (score of 4) (this was added to the original scoring by Romijn and Albaladejo, 2002; “(f) innovation fundamentally new to the market” (score of 5).

We think that this two-dimensional approach, i.e., using both incremental innovation and radical innovation, allows us to measure innovation output of firms relatively well and in depth across firms within an industry. Other researchers have used patents or patent citations (Romijn and Albaladejo, 2002) as an index of innovation output. We have chosen not to use this approach because (a) there are very few firms that have patents in our sample (software is a branch with generally few patents as product cycles are very short); (b) innovations in small firms are protected very differently than in large firms (getting a patent may be an impetus for other firms to develop their own approach to achieve the same effect; also patenting a product is usually quite expensive); (c) our approach is in line with the fact that firms have to make an explicit judgment to introduce certain innovations in the market; (d) we showed that there is high agreement among the two and more employees who answered the questionnaire; thus, individual and idiosyncratic responses are not responsible for our results; and (e) from our observations and interviews we had the impression that biases (e.g., in terms of painting a more rosy picture of the firms’ innovation output) were not frequently used — firm employees and even high level managers quite readily admitted if they did not invest into innovations. Thus, we have a certain degree of confidence in our measure of innovation although it is based on employees’ perceptions.

Team Climate Inventory (TCI): To examine the function of PI climate, we included the scale “support for innovation” as well as the other two scales of the validated German version of the TCI (Anderson and West, 1996;
S. Fischer et al.

Brodbeck et al., 2001): (a) “vision”, (b) “support for innovation” and (c) “task orientation” (we followed West and Anderson’s (1996) strategy of including only three scales in some of their studies). The items were changed from the team level to the organizational level. An example of the reformulated item is: “This firm is open and responsive to change”. To keep the number of items in the questionnaire to a minimum, we reduced the number of items in each scale (to include items with high item-total correlations), and we included only three scales with a total of 15 items. From the 15 items we obtained an individual-level organizational climate for innovation score. This score was aggregated to the firm level. The internal consistency (Cronbach’s $\alpha = 0.91$) and the ICCs and $R_{WG} (R_{WG(j)} = 0.99; ICC(1) = 0.48; ICC(2) = 0.73$) were all acceptable.

**PI climate**: This variable was assessed with the validated German version of Baer and Frese’s (2003) 7-item measure of PI climate. Responses were recorded on 5-point Likert-type scales with options ranging from 1 (*does not apply at all*) to 5 (*applies completely*). An example item is: “People in our company take initiative immediately — more often than in other companies.” The internal consistency (Cronbach’s $\alpha = 0.85$) and the ICCs and $R_{WG} (R_{WG(j)} = 0.82; ICC(1) = 0.54; ICC(2) = 0.78$) were all acceptable.

**Control variables**: We controlled for industry by sampling only software firms (Szymanski et al., 2007). We ascertained and controlled two potential other variables: firm age (Puranam et al., 2006) and firm size (number of employees) (Camison-Zomoza et al., 2004).

**RESULTS**

Table 2 presents the intercorrelations of the variables on the organizational level ($n = 25$). There were high correlations of firm age with the culture/climate predictors of both indicators of innovation. This may suggest that older firms do not provide positive climate factors. However, the potential control variables, firm age, and number of employees were not significantly correlated with both indicators of innovation. Therefore, to reduce the number of variables in the regression analyses and to improve the ratio of variables to predictors, we decided not to use the control variables in any of the further analyses.

There is some empirical support for Hypotheses 1, 2, and 3 in Table 2, as there were significant correlations of both the TCI and the PI climate with incremental innovation and radical innovation. There was also a high
Table 2. Correlations Among Study Variables (Organizational Level).

<table>
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<th>M</th>
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<th>N</th>
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<td>5 Task Orientation (subscale TCI)</td>
<td>3.55</td>
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<td>25</td>
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<td>0.88**</td>
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<td>6 Vision (subscale TCI)</td>
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</tbody>
</table>

Note: N = 25. **p < 0.01; * p < 0.05; +p < 0.10.

Table 3. Results of Regression Analyses: Standardized Regression Coefficients, Confidence Intervals, and Explained Variances.

<table>
<thead>
<tr>
<th></th>
<th>Radical Innovation (Leader Evaluation)</th>
<th>Incremental Innovation (Leader Evaluation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>90% CI</td>
</tr>
<tr>
<td>Team Climate Inventory</td>
<td>0.17 [−0.53, 0.81]</td>
<td>0.36* [−0.05, 0.68]</td>
</tr>
<tr>
<td>R²</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>AR²</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>PI climate</td>
<td>0.88* [0.67, 1.9]</td>
<td>0.43 [−0.15, 0.92]</td>
</tr>
<tr>
<td>R²</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>AR²</td>
<td>0.25*</td>
<td></td>
</tr>
</tbody>
</table>

Note: N = 25; linear regression modeling results. 90% CI = Bias-corrected and accelerated-(BCa) method.
* p < 0.05; +p < 0.10.
correlation of the TCI with PI climate \( (r = 0.82, p < 0.01) \). Incremental innovation and radical innovation were also highly correlated \( (r = 0.63, p < 0.01) \).

Whenever there is high common variance between the predictors, it is important to know whether the new variable — climate for personal initiative—increases explained variance in the dependent variables. The regression analyses in Table 3 provide answers to this question and to Hypothesis 3: PI climate explains 25\% of the variance of radical innovation in addition to TCI (the increment was significant on the 0.05 level). However, with regard to incremental innovation, only TCI was related at marginal significance \( (\beta = 0.36, p < 0.10, 90\% CI [-0.05, 0.68]) \). Bootstrap results indicate that this result may be due to outliers.

**DISCUSSION**

By and large, our hypotheses have performed reasonably well. Hypothesis 1 states that PI climate is related to radical innovation over and above the TCI, but not to incremental innovation. This differential pattern exists in spite of the high correlation between incremental and radical innovation. As predicted by Hypothesis 2, we find significant correlations between PI climate and the TCI. Finally, as stated in Hypothesis 3, the TCI by Anderson and West (1998) relates to incremental innovation — this is tentatively the case as the bootstrap confidence interval does include zero in this regression analysis (cf. Table 3); whereas the TCI does not predict radical innovation. These results imply that the TCI is more useful for the statistical prediction of a general form of incremental innovation, while PI climate explains additional variance for radical innovation beyond the TCI. Therefore, we suggest that future research on organizational innovation might include both the TCI and a measure of PI climate, depending on researchers’ specific interests. Additionally, we encourage researchers to explicitly incorporate incremental and radical innovation into the theoretical development of hypotheses (Subramaniam and Youmdt, 2005). This research shows that there are different antecedents for both forms of innovation on the level of organizational climates.

Findings from the present study on the PI climate suggest that the function of initiative should be explicitly modeled in organizational innovation research. We argue that initiative has two functions: First, it increases the number of ideas because PI climate encourages people to think of new ideas (Binnewies et al., 2007; Frese et al., 1999). Second, PI climate encourages an active approach to implementing these ideas. A high PI
climate allows people to change their work places to be more effective and efficient (Baer and Frese, 2003). Moreover, a high PI climate also encourages people to implement new radical ideas on the organizational level; thus, organizations high on PI climate are probably more likely to put radically new ideas into effect (i.e., convert them into products and push them into the market). It is probably this second aspect of climate of initiative (implementation aspect) that leads to the effects that are different from TCI; we assume that team climate can explain the first function — support for the development of ideas — better than the second function (put ideas into effect). Thus, one future contribution could be to explicitly model the importance of initiative for implementation.

Strengths, Limitations, and Future Research

The strength of our study lies in our attempt to measure independent (organizational climate) and dependent variables (organizational innovation) via different sources. The innovation variable was measured using the highest ranking key informant because a better judgment of this construct will be provided by managers. The climate variables were measured by the assessments of lower ranking respondents (again, they should be better able to understand the true climate in a firm than higher ranking managers). This strategy should reduce common method biases, at least those stemming from individual-level common methods biases, such as consistency motive, implicit theories, social desirability, leniency bias, acquiescence, halo effects, and mood effects (Podsakoff et al., 2003, 2012). Since we posed all questions to all participants, we were able to calculate the agreement for all respondents, and the ICCs demonstrated that agreement was considerable, and also across ranks.\(^1\)

These are the major limitations to the study. First, although we took some safeguards that work against common method variance, we did not have objective indicators for incremental or radical innovation. Future research may attempt to examine the relationships of PI climate with patent and patent citation data or with external judgments of the innovation potential of firms.

\(^1\)The high ICCs imply that our differentiation between different sources for independent and dependent variables may not have been necessary. To examine this question, we also calculated the same regression analyses as described in Table 3 with all the information from all participants; that is, we used all participants’ scores for the independent (climate variables) as well as dependent variables (innovation variables). The results for PI climate were the same — PI climate added significantly explained variance to radical innovation; in this case, neither team climate inventory nor climate for innovation were significantly related to incremental innovation. Thus, our results are robust to the source of our measures for PI climate.
Second, our study was based on a small sample of firms \((N = 25\) firms with a total of \(N = 82\) participants). Our study shares this problem with many other studies on organizational climate and culture. For example, Brodbeck and Maier (2001) based two of their studies on industrial samples of 30 and 35 teams. However, aggregated scores often provide high power and high correlations because reliability of the measures is high when several sources of information are included. Therefore, in our study, power was high enough to obtain significant results. However, small sample correlations are often based on one or only a few participating firms. Although there was no clear outlier in the present study, visual inspection of the scatter plot revealed one firm that pushed the correlation higher. A robustness test showed, however, that omitting this firm from the analysis still produced the same significant regression result that PI climate is significantly related to radical innovation.

Third, results do not necessarily transfer to large companies. We used small and medium-sized firms precisely because we wanted to achieve a certain degree of homogeneity of the culture/climate measures. This was based on the rationale that such a step is empirically useful because transporting the original team constructs to organizational-level constructs already carried some risk that climate variables would function differently on a higher organizational level than on the team level. Therefore, it may be useful, in the future, to study larger companies and to explicitly model the issue of strong vs. weak culture/climate (Schneider et al., 2002).

Obviously, our cross-sectional study design does not allow us to assert that the causal relationship between climate and innovation is confirmed; therefore, longitudinal and intervention studies are needed to examine this more closely. Fortunately, as a basis, there is at least one study that has longitudinally examined the effects of PI climate on changes in firm performance — the study by Baer and Frese (2003).

**Practical Implications**

Practical implications exist for companies that want to enhance their innovation output. Although the present analysis did not demonstrate causality, it may pay off to change the climate of the firm. In principle it is possible to do such changes, although the literature agrees that this is a difficult endeavor (O’Reilly and Chatman, 1996). Most likely, such a change processes will require a long-term approach that is highly visible, accompanied by a clear vision that allows early wins, that is supported by
good incentives, and allows the systematic introduction of new personnel that agrees with this new climate.

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References


