Innovation is Not Enough: Climates for Initiative and Psychological Safety, Process Innovations, and Firm Performance

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Abstract

This paper contributes to the discussion on contingencies of process innovations by focusing on and introducing organizational-level constructs of climate for initiative and psychological safety. We argue that process innovations, defined as deliberate and new organizational attempts to change production and service processes, need to be accompanied by climates that complement the adoption and implementation of such innovations. Our study of 47 mid-sized German companies examines the relation between process innovations, climates for initiative and psychological safety, and firm performance. Results show that climates for initiative and psychological safety were positively related to two measures of firm performance – longitudinal change in return on assets (holding prior return on assets constant) and firm goal achievement – and moderated the relation between process innovations and firm performance.

Introduction

"Innovation has become the industrial religion of the late 20th century. Business sees it as the key to increasing profits and market share. Governments automatically reach for it when trying to fix the economy" (Innovation in industry, 1999, p. A1). In particular, innovations aimed at enhancing organizational production and service procedures and processes such as Business Process Reengineering (BPR), Total Quality Management (TQM), Lean Production, Simultaneous Engineering, or Just-in-Time Production (JIT) have been embraced by a wide variety of businesses with increasing frequency. We define those deliberate and new organizational attempts to change production and service processes as *process innovations*. While terms such as *manufacturing practices* and *management techniques* have been used to categorize new practices like team-based work and TQM (Waterson *et al.*, 1999; Staw and Epstein, 2000), West *et al.* (2002) recognized these practices as innovations and distinguished between innovations in production technology, in production processes, in work organization, in human resource management practices, and product innovations. We concur with West *et al.* (2002) in viewing these as innovations due to the novel issues that are associated with their adoption and implementation.

Process innovations are assumed to bring multiple benefits to an organization and help an organization achieve competitive advantage. However, a considerable number of businesses have adopted these practices without much success. For example, Waterson *et al.* (1999) studied the effectiveness of several modern manufacturing practices in the UK and discovered that approximately 50-60% of the companies thought their innovations met objectives only "moderately", "a little", or "not at all". Studying the implementation of BPR in 216 U.S. and Canadian hospitals, Ho *et al.* (1999) found that most hospital executives indicated that process reengineering efforts were barely to moderately successful in accomplishing the desired objectives. Finally, in a recent study on the organizational effects of popular management techniques, Staw and Epstein (2000) found no significant relation between companies being associated with quality, teams, and empowerment, and changes in economic performance over time. They also found no effects of TQM implementation on performance.

One possible explanation for these findings is that despite a high level of implementation, critical contingencies that complement the process innovations are not in place. Contingencies that have been considered important to the success of TQM, for example, are organizational structure, culture, and climate (Detert *et al.*, 2000; Douglas and Judge, 2001; Emery *et al.*, 1996). In this paper we concentrate on organizational climate as a contingency and identify those climate dimensions that positively affect the relation between process innovations and company performance. Process innovations are often employed "off the shelf", causing the human side of the socio-technical system to be lost (e.g., Harmon, 1992). The need to develop organizational climates in which people participating in the change process feel safe in taking interpersonal risks, are encouraged to propose new ideas, openly discuss problems, and proactively approach work is easily neglected, leading many technically driven implementation attempts to failure. Specifically, we examine the direct and indirect effects of two climate dimensions – climate for initiative and climate for psychological safety – on two measures of firm performance – change in return on assets (ROA) and firm goal achievement. To our knowledge, this has not been done before.

Research on manufacturing practices (Waterson *et al.*, 1999) has shown that organizations tend to adopt multiple innovations simultaneously. Accordingly, our primary concern is to identify those climate dimensions that affect the success of process innovations in general rather than specifying conditions that are unique to individual process innovations such as BPR, TQM, or JIT. However, we use examples of those specific innovations to support our focus on two particular aspects of organizational climate as being crucial in complementing these improvement initiatives.

We find that two climate dimensions are of particular importance in complementing the successful adoption of process innovations. First, the organizational environment has to be supportive of an active approach toward work (Frese *et al.*, 1996). For example, in exploring the nature of work under TQM, Victor *et al.* (2000) found that TQM was dual in nature, consisting of activities related to continuous improvement as well as activities related to standardized production work. They argued that performance and degree of implementation both depended on employees' abilities to autonomously switch between those role requirements. Tailby and Turnbull (1987) argued for the need of employees to show initiative in the context of Just-in-Time Production. Due to the absence of local buffers in JIT, disruptions in the work process lead to negative consequences at a later stage of the production process, possibly leading to failure to meet delivery deadlines. To reduce disruptions, employees need to be able to sense problems and act proactively about them before they occur, indicating the importance of initiative at work (Parker, 1998). Proactively switching between dual work roles and keeping production running smoothly requires a work environment in which such behaviors are expected, valued, and frequently displayed, or a climate for initiative.

Second, the work environment has to be one in which people are safe to take interpersonal risks and value each individual's contribution to the work process (Edmondson, 1999). One characteristic common to most process innovations is the increased focus on cooperation. For example, Detert *et al.* (2000) argue that one key value of TQM is its focus on collaboration as a means to enhance decision-making, quality, and morale. Similarly, Just-in-Time Production is a process that increases employees' dependence on each other's work, thereby increasing the need for employees to collaborate in their work (Parker and Wall, 1996). Successful cooperation requires the existence of a climate in which employees feel safe in displaying proactive behavior in a social context, or a climate for psychological safety. Accordingly, a climate of trust and support has been linked to successful TQM implementation (Emery *et al.*, 1996).

The first goal of our study is then to examine the importance of organizational climates for initiative and psychological safety in achieving the intended performance benefits of innovations, thus moderating the relation between process innovations and firm performance.

Our second goal is to explore the existence of main effects of climates for initiative and psychological safety on firm performance, independent of their effects on the relation between process innovations and performance. Research on climate has provided some support for the direct link between climate dimensions and business performance (Denison, 1990; Marcoulides and Heck, 1993). In a recent study of companies from growing as well as declining industries, Kangis and Williams (2000) found support for a positive relation between measures of perceived work environment and various indicators of organizational performance. Similarly, Stetzer and Morgeson (1997) suggested that organizations with high performance climates will not only be more effective, but will also avoid organizational ineffectiveness and lost productivity. In their study of 25 outdoor work crew divisions, they found that a climate characterized by quality and cooperation was negatively related to indicators of organizational ineffectiveness. In line with research on organizational climate, this paper investigates the direct relation between climate and organizational performance.

Before we explore the nature of the two climate dimensions in greater detail, we discuss the definitions that our climate factors are based on and review our rationale for conceptualizing climates for initiative and psychological safety on the organizational level of analysis.

Organizational Climate

There are two conflicting views regarding the nature of organizational climate (Glick, 1988). James (1982) and James *et al.* (1988) conceptualized organizational climate as an aggregated psychological climate. Psychological climate refers to a "set of perceptions that reflect how work environments, including organizational attributes, are cognitively appraised and represented in terms of their meaning to and significance for individuals" (James *et al.*, 1988, p.

129). They argue that if people in an organization share similar perceptions of a psychological climate dimension, it is legitimate to aggregate these individual perceptions into an indicator of organizational climate. Thus, organizational climate is the property of individuals and refers to how individuals in an organization generally perceive the organization. However, since the aggregation of multiple individual perceptions requires some level of agreement, an organizational climate does not exist if people substantially differ in the way they perceive organizational characteristics (Glick, 1988).

In contrast to this view, Glick (1985, 1988) has repeatedly argued for the conceptualization of organizational climate as an organizational rather than individual attribute resulting from sociological and organizational processes. He defines organizational climate as “a broad class of organizational, rather than psychological, variables that describe the organizational context for individuals’ actions” (Glick, 1985, p. 613). Such organizational variables mainly refer to formal and informal interpersonal practices (Schneider, 1985) and intersubjectively developed meanings resulting from organizational sense-making processes (Glick, 1985). Whereas James (1982) and James *et al.* (1988) define organizational climate as an average of individuals’ perceptions, Glick (1985, 1988), Schneider (1985), and Schneider and Reichers (1983) conceptualize organizational climate in terms of other constructs such as interpersonal practices, intersubjectively developed meanings, and policies and practices, and not as a mere aggregation of psychological climate. However, whether climate is a shared perception or a shared set of conditions remains a controversy in the literature (Denison, 1996).

In contrast to *climate*, which refers to surface level manifestations of underlying values and assumptions (Denison, 1996), *culture* constitutes a “deeper, less consciously held set of meanings than most of what has been called organizational climate” (Reichers and Schneider, 1990, p. 24). According to Schein (1985), culture exists simultaneously on three levels. At the deepest level are assumptions, basic beliefs about reality and human nature. Values, or social principles, goals, and standards thought to have intrinsic worth constitute the second level. Finally, on the surface are artifacts, which are the visible and tangible results of activity grounded in values and assumptions. Climate is largely concerned with those grounded activities that produce visible and tangible outcomes. Thus, we concur with Reichers and Schneider (1990) that climate can be conceptualized as a manifestation of culture and that culture can most accurately be understood as existing at a higher level of abstraction than climate.

In this paper we adopt Glick's (1985, 1988) definition of organizational climate. Our study concentrates on process innovations that affect the wider organization of manufacturing, referring to practices and philosophies with an organization-wide focus (Bolden *et al.*, 1997). Achieving the intended benefits of process innovations depends upon the effort of the organization as a whole. Organizations that display a work environment characterized by initiative and psychological safety may have a higher chance in promoting the effectiveness of process innovations. Accordingly, we conceptualize climates for initiative and psychological safety as organizational-level constructs (Klein *et al.*, 1994) that describe organizational attributes regarding initiative and interpersonal safety.

Climate for Initiative

As an organizational-level construct, climate for initiative refers to formal and informal organizational practices and procedures guiding and supporting a proactive, self-starting, and persistent approach toward work. Our conceptualization of climate for initiative is derived from the construct of personal initiative (Frese *et al.*, 1997; Frese *et al.*, 1996), which was developed as an individual-level construct. Support for the notion of a climate for initiative comes from research on taking charge (Morrison and Phelps, 1999). Investigating the factors that motivate employees to engage in this form of extrarole behavior, Morrison and Phelps (1999) found that taking charge was related to felt responsibility, self-efficacy, and perceptions of top management openness. Their results suggest that top management support for a general climate for initiative is important for people to show initiative.

Our first prediction is that climate for initiative is positively related to organizational performance. Potential mechanisms for the effects of climate for initiative are: Top management and peers allow and encourage personal initiative of individuals and groups (Morrison and Phelps, 1999), people and groups feel responsible for their work (Frese *et al.*, 2002), people exercise more discretion in how they do their jobs (Frese *et al.*, 2002), and people work on their ideas longer and with more intensity in order to turn them into useful suggestions (Frese *et al.*, 1999).

Evidence suggests that individual-level personal initiative is related to better performance. Proactive blue- and white-collar workers perform better (Hacker, 1992), primarily because they prevent negative events from occurring and they plan better and are more active in acquiring useful information (Wall *et al.*, 1992). Proactive personality – a concept similar to personal initiative but conceptualized as a dispositional construct – has also been shown to be related to career success (Seibert *et al.*, 1999) and to individual job performance in real estate agents (Crant, 1995).

Frequently, however, initiative is negatively sanctioned by peers or managers because taking initiative "rocks the boat" and is perceived as threatening by those directly affected. In the short run, initiative may not be welcome because it interrupts routines. In the long run, however, a high degree of personal initiative in the workforce leads to new ideas, smoother production and service processes, better implementation of innovations, and ultimately to better performance. Formal and informal organizational practices and procedures guiding and supporting a proactive, self-starting, and persistent approach toward work are potentially helpful in increasing organizational performance through encouraging a high level of initiative in the workforce. In such a climate, actions are taken to prevent problems and errors that lead to serious disruptions in production, actions and ideas that help production are self-started even if nobody is around to help or give orders, and difficulties and problems are met with persistence to overcome them. All of these factors should help to increase smooth production, thereby increasing company performance. A climate for initiative should therefore increase general organizational-level performance.

Secondly, a climate for initiative is hypothesized to function as a contingency variable that supports process innovations being realized to their full potential. We defined organizational process innovations as deliberate and new organizational attempts to change production and service processes. Whenever something new is introduced in an organization, smooth functioning can only be achieved when people actively participate in the introduction of the innovation. Furthermore, innovation implementation cannot be planned in such a way that no unexpected problems occur along the way. Problems must therefore be anticipated and dealt with proactively and the implementation itself often requires that people think about and use new procedures with a self-starting sense.

A climate for initiative also continues to play an important role after an innovation has been fully implemented. More traditional production processes are characterized by putting responsibility for production into the hands of management. In contrast, modern manufacturing concepts put responsibility for production and quality back into the hands of shop floor employees (Imai, 1986; Wall and Jackson, 1995). Furthermore, newer production systems are characterized by a higher degree of production uncertainty (Wall and Jackson, 1995; Wright and Cordery, 1999). Less certainty implies more unexpected problems and barriers that need to be overcome and the necessity of self-starting behaviors to avoid production breakdowns. Thus, the extent to which the work environment is characterized as being open to and supportive of an active approach toward work is essential.

What happens if process innovations are implemented in a company with a low level of climate for initiative? In such a climate, people may feel helpless and victim to the innovation.

They may not act when things go wrong. Since problems appear during the implementation of an innovation, innovation paired with a low level of climate for initiative may negatively effect company performance. Thus, we predict that firm performance depends on the interaction between process innovation and climate for initiative; that is, climate for initiative functions as a moderator.

Climate for Psychological Safety

Psychological safety was originally used as an individual- and team-level concept. To demonstrate a relation between perceived psychological safety climate and job involvement, effort, and performance, Brown and Leigh (1996) adopted Kahn's (1990) definition of psychological safety as referring to an employee's "sense of being able to show and employ one's self without fear of negative consequences to self-image, status or career" (p. 708). Edmondson (1999) defined team psychological safety as a shared belief that a team is safe for taking interpersonal risks and found strong support for an association between team psychological safety and team learning behavior, which in turn was related to team performance. We extend the construct of team psychological safety to an organizational climate for psychological safety. A climate for psychological safety refers to formal and informal organizational practices and procedures guiding and supporting open and trustful interactions within the work environment. Thus, a climate for psychological safety describes a work environment where employees are safe to speak up without being rejected or punished.

Employees working in an organization that provides a personally non-threatening and supportive climate should be more likely to take the risk of proposing a new idea than in an environment where "proposing a new idea will lead to an attack, to him or her being censored, ridiculed or penalized…" (West, 1990, p. 312). In other words, organizations with a climate for psychological safety will enhance learning behavior as well as the use of employees' creative potential. Potential mechanisms by which climate for psychological safety produces a higher degree of performance are: Ease and reduced risk in presenting new ideas in a safe climate (Edmondson, 1999; West, 1990), better team learning (Edmondson, 1999), higher level of job involvement and exertion of greater effort (Brown and Leigh, 1996), and smoother collaboration in solving problems. Thus, we propose that companies displaying a strong climate for psychological safety perform better than companies that fail to establish such a climate.

In addition to the direct relation to performance, climate for psychological safety should also function as a moderator of the relation between process innovations and firm performance. Since modern process innovations are characterized by a higher degree of interdependence of traditionally distinct processes (Dean and Snell, 1991), there is an increased need for employees to collaborate in their work (Parker and Wall, 1996). Since employees must increasingly perform activities that are more interpersonal in nature, feeling safe in interactions becomes important. Furthermore, employees must be able to take the risk of openly proposing new ways of working and to come up with alternative problem-solving approaches. A climate in which it is safe to speak up and take risks is argued to complement the adoption and implementation of modern process innovations, thereby functioning as a critical contingency in enhancing the full potential of innovations.

In summary, we investigate the following hypotheses:

Hypothesis 1: Climate for initiative is positively related to company performance.

Hypothesis 2: Climate for initiative moderates the relation between process innovations and company performance such that a high level of climate for initiative is associated with a positive relation and a low level of climate for initiative is associated with a negative relation.

Hypothesis 3: Climate for psychological safety is positively related to company performance.

Hypothesis 4: Climate for psychological safety moderates the relation between process innovations and company performance such that a high level of climate for psychological safety is associated with a positive relation and a low level of climate for psychological safety is associated with a negative relation.

Method

Sample and Procedures

The sample was developed from information on over 6000 German companies provided by Hoppenstedt (1998). In selecting companies, we used four major criteria. First, the companies had to employ between 100 and 900 persons. We focused on mid-sized companies because we believe that the assessment of organizational climate becomes more difficult as the number of employees increases and only smaller companies are characterized by a unitary climate. Second, we chose companies from the industrial and service sectors because of the widespread use of process innovations in those sectors and because companies from those sectors are typical of the German economy (Simon, 1996). Third, we required current information on the financial performance of the company. Fourth and finally, since merging can have a strong negative effect on a company's economic performance (Bühner, 1990), we excluded any companies that had recently merged.

In collecting information on organizational climate and process innovations, we focused on an organization's management. There were two reasons for this. First, management receives information on a wide variety of departments and is therefore a more valid source for the assessment of an organization's general climate and the level of change in process innovations. Additionally, management plays a key role in forming and shaping an organization's climate by setting the tone in the organization and determining the kinds of behaviors that are expected and supported. Second, concentrating on an organization's management may allow one to control for potential sources of bias. Perceptual measures of organizational climate are frequently biased by characteristics of the informants. To control for this, Glick (1985) recommended the use of a sampling strategy advocated by Seidler (1974), in which researchers should systematically select the same kind of key informants in all of the sampled organizations. This strategy is argued to hold the level of bias constant across organizations, thereby increasing the validity of the organizational climate measure. To obtain information from the same kind of key informants, we approached the managers of the selected organizations.

Based on company information from the database, we selected one manager from either the personnel or marketing department per company, or if no such information was available, questionnaires were addressed to the personnel department. Each company then received seven questionnaires on climate and organizational change. The contact person was asked to distribute the questionnaires to his or her colleagues, providing as much a representative cross-section of their company's management as possible. We included companies that returned three or more questionnaires in our analyses. In all, 269 companies were approached and a total of 47 companies (17%) provided sufficient data for inclusion. From 37 of these (79%), we received three questionnaires; from 10 (21%) we received four or more questionnaires (number of individual respondents = 165).

Companies were located across Germany and included a variety of industries. Nineteen sectors were identified using the Standard Industrial Classification Codes (SIC). The firms in this study represented manufacturing (60%), utilities (6%), commerce (11%), financial services (10%), and miscellaneous service industries (13%). The average firm size was 410 employees (SD = 272.48). Of the 47 companies, 49% were limited liability companies and 51% were publicly traded. To test whether the firms included in our analyses were representative of the sample as a whole, we computed chi-square tests on sectors and legal forms. No significant differences were found for sector distribution ($\chi^2 = 1.898$, $p > .10$) or legal form ($\chi^2 = 0.297$, $p > .10$). Thus, firms included in our study showed a sector and legal form distribution similar to the sample as a whole. Further, we performed *t*-tests on two additional variables: average number of employees (one of the control variables) and firm performance as measured by return on assets 1998 (one of the dependent variables). There were no statistically significant differences between participating and nonparticipating companies in terms of average number of employees (mean difference = 48 employees, $t = 1.14$, $p > .10$) or return on assets 1998 (mean difference – 4.38%, $t = -.74$, $p > .10$). These data suggest that firms included in our analyses were not systematically different from the sample as a whole with regards to firm size, firm profitability, sector distribution, or legal form.

Measures

The questionnaire contained twelve items regarding the level of change on process innovations (one per practice), scales on initiative and psychological safety, and finally, a self-reported measure of the firm's goal achievement. All measures formed five-point scales ranging from 1 (doesn't apply at all/no change at all) to 5 (entirely applies/a lot of change). Additionally, we obtained information on firm profitability (Hoppenstedt, 1999).

Process innovativeness. We selected twelve types of process innovations frequently used in modern companies, such as Business Process Reengineering and Just-In-Time Production. These twelve practices are based on the empirical and theoretical work by Bolden *et al.* (1997) and Waterson *et al.* (1999), who reviewed the research on modern manufacturing techniques and suggested twelve core techniques. We presented a short definition of each innovation so that respondents understood specifically what we meant. Each innovation was measured by one item and respondents were asked to estimate on a five-point scale ranging from 1 (no change at all) to 5 (a lot of change) the degree of change that had taken place in their company over the last two years with respect to each process innovation (Table A1).

Since we believe that climate factors are of particular importance when organizational processes change, we constructed the measures of process innovations to capture the degree of change rather than the degree of implementation or use. Waterson *et al.* (1999) reported that the extent of use of these innovations was highly intercorrelated and concluded that there was a general orientation of companies to innovate or not to innovate. In our data, these process innovations were also highly intercorrelated and we therefore calculated an index of process innovativeness by averaging values across the twelve innovations (α = .91). The rationale behind this measure was to specify the mean level of process innovation as an indicator of an organization's willingness to innovate rather than to imply that a higher level of process innovativeness is necessarily better. All hypotheses were tested using this composite measure of changes in process innovations.

Climate for initiative. The measure of climate for initiative was adapted from the seven-item measure of self-reported initiative by Frese *et al.* (1997). The seven items were transformed to be used on the organizational level for initiative. A sample item is "People in our company use opportunities quickly in order to attain goals." (α = .94). The items are reproduced in the Appendix (Table A2).

Climate for psychological safety. The measure of climate for psychological safety contained seven items developed by Edmondson (1999). These seven items were transformed to be used on the organizational level and were translated into German. A sample item is "When someone in our company makes a mistake, it is often held against them." (reversed scoring). The item "No one in this organization would deliberately act in a way that undermines others' efforts" was excluded from the scale because it was misleading. Participants seemed to respond to this item as if it was negatively formulated, thereby reducing internal consistency of the scale (α = .82 with six items). The items included in this scale are listed in the Appendix (Table A3).

Firm performance. Two indicators of firm performance were used in this study: firm goal achievement and return on assets. Firm goal achievement measures one aspect of firm performance, namely, how well the company is doing with regard to its own goals and in comparison with its direct competitors. This two-item measure of subjective performance was chosen for this study despite the fact that there are some disadvantages to measures of subjective performance. We adopted this type of assessment because firms in our sample come from different industries and are likely to have diverse goals and subjective perceptual assessments of firm performance are particularly appropriate when firms have diverse goals (Fey and Beamish, 2001). Second, since certain sectors might be more successful than others, this measure is sensitive to potential sector differences with regard to firm success by capturing a focal firm's performance relative to the performance of relevant competitors. Our two-item measure of firm goal achievement was taken from Van Dyck, Frese, and Sonnentag (2002) and was translated into German. The two items were "How successful is your organization in comparison to other companies in the same line of industry and of (about) the same size?" and "To what degree has your organization achieved its most important goals?" ($\alpha = .83$). The correlation between this measure of firm performance and return on assets 1998 was .41 ($p < .01$) (see Table 1).

We also used a common accounting-based measure to capture firm profitability: return on assets. Return on assets was calculated by dividing annual profit plus interest expense by averaged invested capital with data being taken directly from the profit and loss account. Return on assets is a relevant measure of operating efficiency as it reflects a company's long-term financial strength. Bühner (1990) used return on assets to investigate the success of corporate mergers, arguing that this measure is appropriate due to its accurate evaluation of a company's profit strength. Moreover, return on assets is a frequently used measure of company profitability (e.g., Daft *et al.*, 1988; Miller and Leiblein, 1996; Snell and Youndt, 1995), and was the profitability ratio most consistently reported by Hoppenstedt (1999). Finally, the use of accounting-based performance measures such as return on assets facilitates comparing results with recent work on the relation between popular management techniques and corporate performance by Staw and

Epstein (2000), who also used return on assets as a measure of economic performance, among others.

The indicator of firm profitability used in this study was taken from a database published by Hoppenstedt (1999). We collected data in the fall of 1998 at a time when information on financial performance for 1998 was not yet available. Firms report their financial results usually at the end of the year and it takes Hoppenstedt a while to process the information, calculate the various profitability ratios, and release their bimonthly-published CD-ROM. We actually used the data on return on assets 1998, which refer to the period between January and December 1998 and became available in the summer and fall of 1999. This is the most important variable for our study because it is objective, it does not come from the same source as the climate variables, and it is the index that most likely is already the result of process innovations that took place during the previous two years. Hoppenstedt did not report return on assets for companies that made losses but rather approximated their return on assets with zero. This was the case for six companies in our sample and to avoid a reduction in sample size we used Hoppenstedt's approximation for return on assets 1998 for those companies. To control for the effects of prior firm performance, we also collected data on return on assets 1997 (Hoppenstedt, 1999) and, again, we used the approximation suggested by Hoppenstedt in cases where firms had made losses. This was the case for four companies. The correlation between return on assets 1997 and return on assets 1998 was .52 ($p < .01$) (see Table 1).

Level of Analysis

For a construct to exist on the organizational level, two criteria must be met (Edmondson, 1999; Kenny and LaVoie, 1985). First, the construct must be conceptually meaningful on the organizational level. We have argued above that this is indeed the case. Also, the measures used in this study refer to the organization as a whole rather than to individual behaviors and attitudes. Second, individual judgments to assess organizational dimensions must converge, such that there is good within-group agreement. To test whether there was homogeneity or agreement within organizations on the ratings of process innovativeness, climate for initiative, climate for psychological safety, and firm goal achievement, we used the estimate of within-group interrater reliability r_{WG} developed by James *et al.* (1984). According to George and Bettenhausen (1990), the interpretation of this within-group interrater reliability coefficient is similar to the interpretation of other kinds of reliability coefficients. A value of .70 or above is considered good within-group interrater agreement.

James *et al.* (1984) proposed a process for controlling for the spurious influences of response biases such as social desirability and positive leniency on the estimates of interrater reliability. To allow for the control of the effects of positive leniency and social desirability resulting in a negatively skewed null distribution, James *et al.* (1984) calculated the expected variance for skewed distributions with a small, moderate, and large negative skew for 5-point scales. We used the ratio of skewness to its standard error as an indicator of the strength of skewness and checked individual items comprising the process innovativeness, climate for initiative, climate for psychological safety, and firm goal achievement scales. In general, items were mildly negatively skewed and accordingly we used the expected variance for distributions possessing a small skew suggested by James *et al.* (1984) ($\sigma_{ESS}^2 = 1.34$). Using the formula for multiple-item estimator $r_{WG(J)}$ (James *et al.*, 1984, p. 88), we estimated within-group interrater reliabilities for each of the 47 companies for process innovativeness, climate for initiative, climate for psychological safety, and firm goal achievement and then calculated an average for each of the four aggregated variables. As shown in Table 1, the average within-organization interrater reliability for process innovativeness, climate for initiative, climate for psychological safety, and firm goal achievement was .74, .84, .81, and .80, respectively. Overall, values of interrater reliability were well above .70, indicating an acceptable level of agreement within organizations and justifying aggregation of data to the organizational level. Accordingly, we averaged the intraorganization responses to represent a firm-level score. All further analyses are based on these data.

Control Variables

Industry and size differences between companies in the sample could have independent effects on firm profitability, and hence explain the direct effects of climate as well as the interaction effects between climate and process innovativeness. Therefore, we used industry and firm size as control variables in our regressions. Hoppenstedt (1999) provided information on industry sectors as well as the average number of employees for each company. As an indicator of industry codes we used a dummy variable representing manufacturing versus nonmanufacturing companies, and as an indicator of firm size we used the natural logarithm of average number of employees. Average number of employees was logged to normalize its distribution. The correlation between return on assets 1998 and industry codes and firm size was 0.29 ($p < .10$) and – 0.31 ($p < .05$), respectively (see Table 1). These correlations suggest that nonmanufacturing and smaller companies tend to be more profitable. In addition to controlling for industry and firm size, we used prior firm profitability (return on assets 1997) as a control variable in regressions predicting return on assets 1998.

Results

Table 1 shows means, standard deviations, within-group interrater reliabilities, and correlations between survey variables and return on assets. Waterson *et al.* (1999) reported that the most commonly used process innovations in the United Kingdom were Supply-Chain Partnering, TQM, JIT, Team-Based Working, and Integrated Computer-Based Technology. The means in Table A1 show that the German companies surveyed reported a similar degree of change in these process innovations. Our findings correspond with those obtained by Waterson *et al.* (1999), enhancing confidence in the reliability of our results.

Insert Table 1 about here

As is shown in Table 1, there was a high correlation between the two climate factors (*r* = .70). To establish the discriminant validity of the climate for initiative versus the climate for psychological safety construct, we performed confirmatory factor analyses (CFA) using LISREL 8 with individual-level data and compared a two-factor model with a single-factor model collapsing both constructs. To assess overall model fit, we used several goodness-of-fit indices: the chi-square goodness-of-fit index, the adjusted goodness-of-fit index (AGFI), the incremental fit index (IFI, Bollen, 1989), the comparative fit index (CFI, Bentler, 1990), and the root mean square error of approximation (RMSEA, Brown and Cudeck, 1993). Following Brown and Cudeck's (1993) suggestion, RMSEA values of less than .05 were assumed to indicate a good fit between the hypothesized model and the observed data. For the other subjective fit indices, we used the commonly employed cutoff value of 0.90.

The one-factor solution did not show an acceptable fit (χ^2 *(df)* = 202.45 (77), *p* = .00, AGFI = .79, CFI = .89, IFI = .89, RMSEA = .10). The two-factor solution had an acceptable overall fit (χ^2 *(df)* = 104.02 (76), *p* = .018, AGFI = .88, CFI = .97, IFI = .97, RMSEA = .05) and described the data significantly better than the one-factor model ($\Delta\chi^2$ *(df)* = 98.43 (1), p = .00, ΔAIC = 96.43). Modification indices for both models suggested allowing within-scale correlated error variances in two cases, indicating that two items of each scale shared more common variance than was captured by the common factor. Since this is not a problem regarding the differential validity of the two constructs, we reran analyses with modified models. The overall fit improved for both models, with the one-factor model yielding a moderate fit (χ^2 *(df)* = 140.12 (75), *p* = .00, AGFI = .84, CFI = .94, IFI = .94, RMSEA = .07) and the two-factor model showing an excellent fit (χ^2 *(df)* = 69.69 (74), *p* = .62, AGFI = .92, CFI = 1.00, IFI = 1.00, RMSEA = .00). Again, the two-factor structure described the data significantly better ($\Delta\chi^2$ *(df)*

= 70.43 (1), p = .00, ΔAIC = 190.68). Thus, both overall fit statistics as well as nested model comparisons suggest that there was sufficient discriminant validity among the two climate constructs.

Since the correlation between the two climate factors is .70, multicollinearity is a problem when conducting regression analyses (Cohen and Cohen, 1983). We conducted separate regression analyses for climate for initiative and climate for psychological safety rather than introducing both in one regression analysis. We used moderated hierarchical regression analyses with centered independent variables (Aiken and West, 1991). In step 1, industry codes, firm size, prior firm profitability, and process innovativeness were introduced to control for extraneous effects of industries, size, and prior financial performance (this variable was entered only in regressions predicting return on assets 1998) of companies and to control for the effects of process innovativeness on performance. In step 2, either climate for initiative or psychological safety was entered. In step 3, the interaction terms between climate and innovativeness were added. Tables 2 and 3 show the results of the moderated hierarchical regression analyses.

Hypotheses 1 and 3 predict that climate for initiative and psychological safety will be positively associated with firm performance. Climate for initiative was significantly related to firm goal achievement ($\Delta R^2 = .26$, $p < .01$) and return on assets ($\Delta R^2 = .06$, $p < .05$). Climate for psychological safety also significantly predicted firm goal achievement ($\Delta R^2 = .08$, $p < .05$) and return on assets ($\Delta R^2 = .07$, $p < .05$). These results support Hypotheses 1 and 3 and suggest that companies that encourage their employees to engage in self-starting behaviors and provide a personally non-threatening work environment are more successful in terms of firm goal achievement and return on assets.

Insert Tables 2 and 3 about here

We also found support for moderator effects of both climate for initiative and psychological safety. The climate for initiative – process innovativeness interaction term accounted for significant incremental variance in firm goal achievement ($\Delta R^2 = .05$, $p < .05$) and in return on assets ($\Delta R^2 = .09$, $p < .01$). These findings indicate that climate for initiative moderates the relation between process innovativeness and firm performance, supporting Hypothesis 2. Hypothesis 4, which predicts climate for psychological safety will moderate the relation between process innovativeness and firm performance, was supported for return on assets ($\Delta R^2 = .06$, $p < .05$). There was no significant increase in explained variance in firm goal achievement, however ($\Delta R^2 = .03$, $p < .10$). Thus, we found only partial support for the moderator hypothesis for climate for psychological safety.

To assess the nature of interactions, we plotted the significant climate – process innovativeness interaction terms for return on assets (Aiken and West, 1991). Consistent with our expectations, we found moderators that reversed the direction of the relation between predictor and criterion, indicating that strong climates for initiative and psychological safety were associated with a positive relation between process innovativeness and profitability, whereas low levels of climates for initiative and psychological safety were associated with a negative relation between process innovativeness and return on assets (Figure 1a and 1b).

Insert Figure 1 about here

Discussion

The goal of this study was to test whether two climate factors – initiative and psychological safety – have both direct and moderating effects on firm performance in mid-sized companies. We have argued that process innovations should be accompanied by a climate that allows for an active approach toward work and interpersonal risk-taking to be successful. Overall, our results support our hypotheses. Hypotheses 1 and 3 state that there are direct relations between climates for initiative and psychological safety and firm performance; this was indeed the case. Thus, psychological safety is not only related to group performance as shown by Edmondson (1999), but also to performance in mid-sized companies. Since aggregation of our organization-level construct was supported by the interrater reliabilities on company climate, the results on the relation with company performance provide additional justification for thinking of a climate for psychological safety not only as a team-level construct, but also as an organizational-level construct.

Our results also support the conversion of the individual-level construct of personal initiative (Frese *et al.*, 1997) into a climate for initiative construct. Koop *et al.* (2000) and Zempel (1999) have shown that individual personal initiative by an owner relates to small and microbusiness success. Our results go one step further to show that climate for initiative can be used on an aggregated company level and that it is related to performance in mid-sized companies.

We also found support for our moderator Hypotheses 2 and 4. Climates for initiative and psychological safety moderated the relations between process innovativeness and company performance, although climate for psychological safety affected only one of the dependent variables: return on assets. Thus, the results are more clear-cut for the moderating role of climate for initiative than for climate for psychological safety. It is of theoretical and practical importance that the moderators were of the so-called C type, which reverse the direction of the relation between predictor and criterion (Podsakoff *et al.*, 1995). As Figure 1 reveals, companies that did not innovate were moderately profitable and successful. However, companies with a high degree of process innovativeness but with low levels of climates for initiative and psychological safety were actually worse off than if they had not innovated at all. Only companies with a high degree of process innovativeness and high levels of climates for initiative and psychological safety did better than those companies that did not innovate. Thus, innovation is not enough and needs to be complemented by climates for initiative and psychological safety to be brought to its full potential.

The hierarchical regression analyses revealed that process innovativeness and performance were only partially related. Beta values for process innovativeness in the regressions including climate for initiative or climate for psychological safety predicting return on assets 1998 were not significant ($\beta = -.09$, $p > .05$ and $\beta = -.10$, $p > .05$, respectively). Moreover, process innovativeness significantly predicted firm goal achievement only in the regression including climate for psychological safety but not in the regression including climate for initiative ($\beta = .33$, $p < .05$ and $\beta = .15$, $p > .05$, respectively). These results indicate that innovation in and of itself is not enough to produce high profitability. However, innovativeness was strongly related to the two climate factors, suggesting that climate may be an important factor in a firm's decision on whether to innovate the process of production and services. West (1990) also argued for the importance of psychological safety to produce innovations. Edmondson (1999) showed that psychological safety leads to team learning and better team performance. A history of innovativeness and climates for initiative and psychological safety may reinforce each other.

The correlation between climate for initiative and climate for psychological safety was quite high ($r = .70$), which may be due to two reasons. First, conceptually, the two variables should be related because there should be a reciprocal relation between climate for psychological safety and climate for initiative. It is easier to show initiative when one feels safe in a company or a group to speak up without risking too much. On the other hand, organizations that have a history of supporting initiative make people feel safe because people in those organizations have successfully taken actions before without being negatively sanctioned. Second, aggregated variables often show high correlations because individual error variance is reduced (correlation between the two climate factors is .58 on the individual level of analysis).

Overall, our results break new ground in the literature on innovation by identifying a complex set of relations between process innovativeness, climates, and organizational performance. Looking at an objective indicator of company performance, we found strong support for a direct and moderating effect of climate. Our findings support the view that climates for initiative and psychological safety are complementary assets without which process innovations may not be realized to their full potential. Both climate factors are critical contingencies to the relation between process innovations and performance, and are argued to help achieve a competitive advantage in two ways. First, climates for initiative and psychological safety support the quality of the implementation process. Second, both climate factors are important to the success of modern process innovations since these innovations are characterized by an increased focus on interdependency, personal responsibility, autonomy, and flexibility, making climates for initiative and psychological safety critical in ensuring enhanced organizational performance.

Limitations

Our study was not able to test all causal hypotheses (climate causing growth in company performance and company performance causing climate changes). On the one hand, we controlled not only for industry and firm size but also for prior performance when predicting return on assets 1998, thereby investigating the direct and interactive effects of both climate dimensions on change in return on assets. Thus, the results reject the reverse causation hypothesis that prior return on assets was responsible for the relations between the two climate variables and change in return on assets. Assuming some temporal stability of organizational climate, the results indicate that climates for initiative and psychological safety play an important role in directly and indirectly determining organizational performance. On the other hand, it is possible that there is a *long-term effect* of organizational performance on climate changes. Our hypothesis is actually that both causal mechanisms play a role: Climate causing changes in company performance and company performance causing climate changes. The literature on company failures supports such reasoning. Failing companies often show hectic and reactive ways of handling a crisis, leading to increased centralization, formalization, standardization, and routinization (Staw *et al.*, 1981; Weitzel and Jonsson, 1989), and consequently, to low levels of climate for initiative and psychological safety, which in turn reduce company performance.

Although we instructed the contact person in each company to distribute the questionnaires to a representative cross-section of that company's management, we did not name the managers that the contact person should distribute the questionnaires to because no such information was available. This data collection strategy might have introduced some bias into the climate ratings since the contact person might have distributed the questionnaires to like-minded colleagues. However, there is at least some evidence that this might not have been the case. Among other background information, respondents were asked to indicate their position in the company. An analysis of the data indicated that managers in various positions (e.g., CEO, CFO, Plant Director) and from various departments (e.g., Production, Marketing, Sales, Finance, Human Resources) within each company participated, providing us with some confidence that the contact person followed our instructions. Nevertheless, like-minded spirits might work in various positions and departments, thus the evidence found does not fully rule out a response bias.

In a related manner, response bias might have been introduced by using top management assessments of organizational climate. While such bias is likely to be similar across the surveyed companies, such assessments might be positively biased which likely results in some restriction of range of the climate variables. However, restriction in range in the assessment of the climate constructs would attenuate existing effects, which otherwise might be even stronger.

Finally, our study was done in Germany on medium-sized firms. The German economy is based heavily on medium-sized firms that are often very successful (Simon, 1996). An obvious question is whether it is possible to generalize the findings in this study to other countries. Since many of the concepts used in this study are rather new, we do not yet have a body of research in this area. However, a few studies point to some degree of generalizability of the results. For example, Edmondson (1999) has shown a relation between psychological safety in groups with team learning and performance in the U.S. In their study of 40 companies in the U.K., Kangis and Williams (2000) found support for a relation between the extent to which coworkers were described as being trusting, friendly, and cooperative and company performance. Our results are in line with these findings. Personal initiative by the owner of micro and small-scale businesses has also been shown to be important for firm performance in two studies in Germany and Africa (Koop *et al.*, 2000; Zempel, 1999). Thus, there is some evidence that suggests generalizability. It would be helpful, however, to do more studies on the company level to assess generalizability.

Practical Implications

Given the consistent interactions between the process innovations and the climate factors, we would argue that systematic efforts to enhance climates for initiative and safety is especially important to companies that want to introduce a process innovation. The idea that to remain competitive, process innovation is essential – a common idea in management – needs to be seriously modified. Effective process innovation can only be achieved if strong climates for initiative and psychological safety exist in the company.

Climates for initiative and psychological safety are also important to increase company performance irrespective of the degree of change in process innovations and they may themselves also lead to a higher degree of innovativeness by a firm. Therefore, we think that the centerpiece of any change process in companies should be to increase climate factors such as psychological safety and initiative before larger changes and innovations are tackled. Another implication of this study refers to change management. Change processes have often been described as suffering under resistance to change (Coch and French, 1948; French and Bell, 1995). The change processes that appear when process innovation is introduced require not only no resistance to change, but an active, initiating approach to deal with problems of implementation. Therefore, our results suggest that climates for initiative and psychological safety should be incorporated into conceptualizations of change management processes.

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Appendix

Table A1. Definitions of process innovations

Process innovation	M	*SD*	Definition
1. Business Process Reengineering (BPR)	3.14	0.80	Radical approach to redesign and slim down operations and production processes to eliminate unnecessary procedures. Essential characteristics of BPR are: customer orientation, increase in process-related teamwork, and the transition from highly specialized workers to teams (Hammer and Champy, 1993).
2. Supply-Chain Partnering	2.88	0.62	An informational network with other relevant companies for the purpose of overlapping company improvement in customer orientation and resource utilization (Handfield and Nichols, 1998).
3. Learning Culture	2.73	0.70	A continuously changing company with the goal of facilitating constant learning to its employees (Pedler *et al.*, 1991).
4. Decentralization	2.77	0.69	The decentralization of tasks, competencies, and responsibilities in primary production areas (Aichele, 1997).
5. Team-Based Work	2.92	0.72	Set of people who interact towards a common objective, have a limited time-span of membership, and a specific function to perform (Salas *et al.*, 1992).
6. Simultaneous Engineering	2.75	0.65	The development of products in shorter time periods, at lower costs, and of higher quality through integrated teamwork (simultaneous design and manufacturing of product) on all production processes (Kusiak, 1992).

(*table continues*)

Process innovation	M	*SD*	Definition
7. Total Quality Management (TQM)	3.05	0.78	A long-term, integrated strategy to facilitate and improve the quality of goods and services through the help of all employees. Essential characteristics are: quality consciousness, customer orientation, continuous improvement, and process orientation (Oakland, 1989).
8. Computer-Integrated Manufacturing (CIM)	2.93	0.81	Integrated information processing for operational and technical tasks. Essential characteristics: process-oriented design of operations and their automation and support through integrated information-processing systems (Hill, 1994).
9. Lean Production	2.60	0.64	Production strategy characterized by: 1) team-oriented work organization, 2) reduction of hierarchy, 3) transfer of responsibility to where goods or services are produced, and 4) integration of planning, development, and production of a product to realize the goals of customer orientation and cost reduction (Womack, 1996).
10. Outsourcing	2.67	0.92	Sub-contracting business processes to external agents (Klepper and Jones, 1997).
11. Empowerment	2.26	0.63	Delegation of responsibility and decision-making to lower levels of hierarchy (Tracy, 1992).
12. Just-In-Time Production (JIT)	2.35	0.79	Establishment of a material and information flow throughout the entire production process to attain a customer demand-oriented delivery service. Essential characteristics of JIT are: integrated information processing, manufacturing segmentation, production-synchronized supply, and the reduction of storage costs (Womack *et al.*, 1990).

Table A2. Climate for initiative items

People in our company actively attack problems.
Whenever something goes wrong, people in our company search for a solution immediately.
Whenever there is a chance to get actively involved, people in our company take it.
People in our company take initiative immediately – more often than in other companies.
People in our company use opportunities quickly in order to attain goals.
People in our company usually do more than they are asked to do.
People in our company are particularly good at realizing ideas.

Table A3. Climate for psychological safety items

In our company some employees are rejected for being different.
When someone in our company makes a mistake, it is often held against them.
No one in our company would deliberately act in a way that undermines others' efforts.
It is difficult to ask others for help in our company.
In our company one is free to take risks.
The people in our company value others' unique skills and talents.
As an employee in our company one is able to bring up problems and tough issues.

Table 1. Descriptive statistics, correlations, and interrater reliabilities

Variable	M	*SD*	1	2	3	4	5	6	7
1. Size[1]	5.79	0.70	–						
2. Industry codes[2]	0.40	0.50	–0.29	–					
3. Process innovativeness	2.75	0.52	–0.01	–0.12	(0.74)				
4. Climate for initiative	3.26	0.55	0.03	–0.02	0.55**	(0.84)			
5. Climate for psychological safety	3.57	0.42	0.07	0.06	0.50**	0.70**	(0.81)		
6. Firm goal achievement	3.39	0.64	0.15	–0.05	0.49**	0.70**	0.49**	(0.80)	
7. Return on assets 1997	9.61	9.30	–0.19	0.27	0.20	0.38**	0.30*	0.34*	–
8. Return on assets 1998	8.61	8.28	–0.31*	0.29	0.13	0.38**	0.38**	0.41**	0.52**

Note. Within-group interrater reliabilities are presented on the diagonal and represent average values for the 47 companies.

[1]Value is the natural logarithm; [2]0 = manufacturing, 1 = nonmanufacturing.

*$p < .05$; **$p < .01$.

Table 2. Hierarchical regression analyses of return on assets 1998 on climate for initiative and climate for psychological safety

	Climate for initiative						Climate for psychological safety					
	Step 1		Step 2		Step 3		Step 1		Step 2		Step 3	
Variable	*ß*	*t*	*ß*	*t*	*ß*	*t*	*ß*	*t*	*ß*	*t*	*ß*	*t*
Size[1]	–0.19	–1.40	–0.21	–1.64	–0.18	–1.44	–0.19	–1.40	–0.23	–1.80	–0.23	–1.82
Industry codes[2]	0.12	0.89	0.13	0.95	0.19	1.49	0.12	0.89	0.09	0.69	0.13	1.04
Return on assets 1997	0.44	3.24**	0.35	2.48*	0.18	1.20	0.44	3.24**	0.37	2.78**	0.29	2.15*
Process innovativeness	0.06	0.43	–0.09	–0.61	–0.13	–0.90	0.06	0.43	–0.10	–0.67	–0.09	–0.64
Climate			0.30	1.92*	0.42	2.75**			0.33	2.23*	0.42	2.81**
Climate × process innovativeness					0.35	2.63**					0.26	2.02*
R^2	0.33		0.39		0.48		0.33		0.40		0.46	
F	5.15**		5.11**		6.04**		5.15**		5.50**		5.61**	
ΔR^2			0.06		0.09				0.07		0.06	
ΔF			3.67*		6.94**				4.96*		4.09*	

[1]Value is the natural logarithm; [2]0 = manufacturing, 1 = nonmanufacturing.

Significance levels are two-tailed for control variables and one-tailed for hypothesized effects.

*$p < .05$; **$p < .01$.

Table 3. Hierarchical regression analyses of firm goal anchievement on climate for initiative and climate for psychological safety

	Climate for initiative						Climate for psychological safety					
	Step 1		Step 2		Step 3		Step 1		Step 2		Step 3	
Variable	*ß*	*t*	*ß*	*t*	*ß*	*t*	*ß*	*t*	*ß*	*t*	*ß*	*t*
Size[1]	0.17	1.24	0.13	1.20	0.18	1.62	0.17	1.24	0.13	0.99	0.14	1.10
Industry codes[2]	0.06	0.44	0.02	0.18	0.04	0.33	0.06	0.44	0.01	0.10	0.03	0.24
Process innovativeness	0.50	3.76**	0.15	1.19	0.13	1.03	0.50	3.76**	0.33	2.25*	0.33	2.27*
Climate			0.61	4.78**	0.65	5.25**			0.31	2.13*	0.37	2.44**
Climate × process innovativeness					0.23	2.22*					0.19	1.45
R^2	0.26		0.52		0.57		0.26		0.34		0.37	
F	5.14**		11.52**		11.07**		5.14**		5.30**		4.78**	
ΔR^2			0.26		0.05				0.08		0.03	
ΔF			22.85**		4.93*				4.53*		2.11	

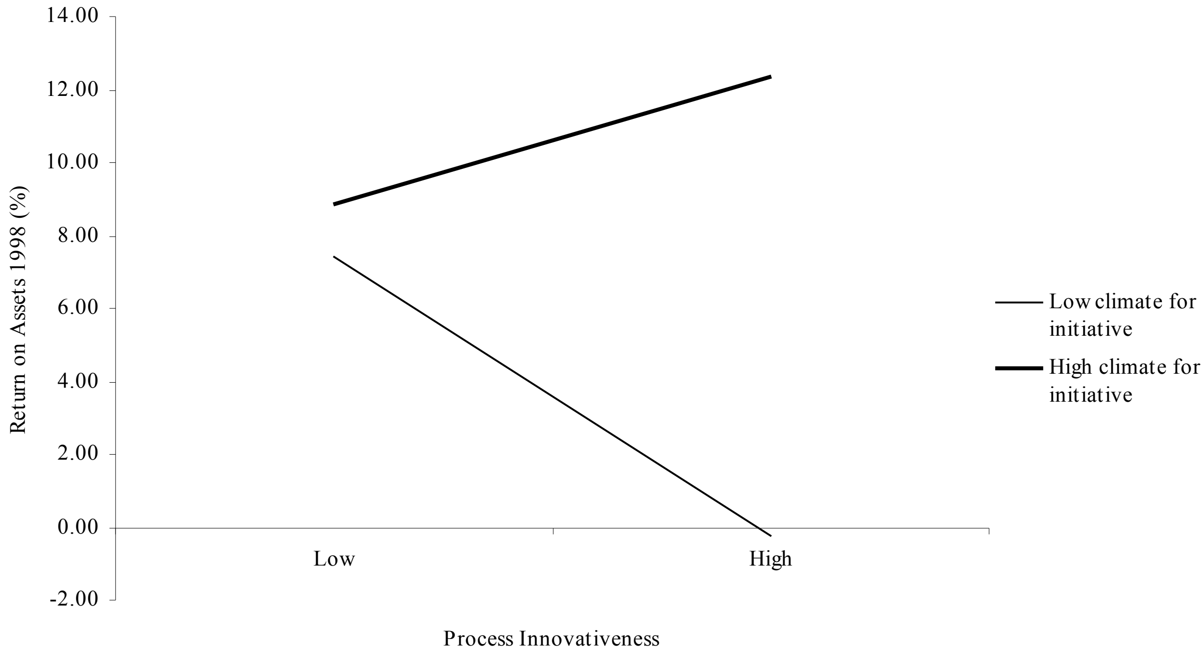
[1]Value is the natural logarithm; [2]0 = manufacturing, 1 = nonmanufacturing.

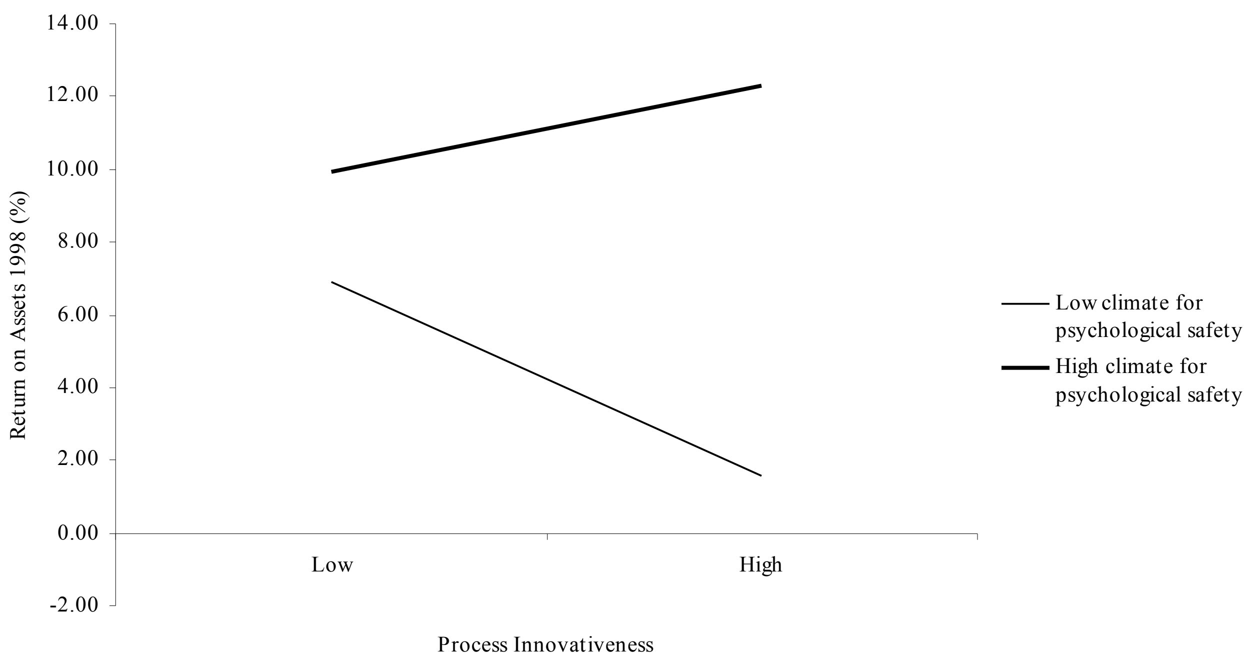
Significance levels are two-tailed for control variables and one-tailed for hypothesized effects.

*$p < .05$; **$p < .01$.

Figure Captions

Figure 1(a). Interaction of climate for initiative and process innovativeness on return on assets 1998. (b) Interaction of climate for psychological safety and process innovativeness on return on assets 1998


14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
Return on Assets 1998 (%)
Low
High
Process Innovativeness
Low climate for initiative
High climate for initiative


14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
Return on Assets 1998 (%)
Low
High
Process Innovativeness
Low climate for psychological safety
High climate for psychological safety