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The Effects of Human Resource Development Investment and Learning practices on Innovative Performance of Organizations

Abstract

In strategy and SHRM literature, scholars have long acknowledged the critical role of human resource as a source of inimitable competitive advance of organizations. Despite prevalent theoretical discourses on the importance of human capital, empirical investigations have mostly focused on the effects of HRM on traditional organizational outcomes such as productivity, financial performance, and turnover. The present study attended to the effect of HRM on organizational innovation that has been largely ignored in the literature. We proposed that an organization's HRD (Human Resource Development) investment promote its innovative performance by facilitating various learning practices. We empirically tested our hypotheses using a longitudinal, multi-source data of 419 Korean companies representing diverse industries. Our analysis showed that HRD investment predicted interpersonal and organizational learning practices, which in turn increased the number of patents over a two year period. The collective learning practices mediated the effects of HRD investment on organizational innovations. Our data also revealed that the positive relationship between collective learning practices and organizational innovation was much stronger in organizations with high innovative climate than in those with low innovative climate. All in all, this study clarifies the mechanism through which HRM efforts lead to a core organizational performance such as innovation.

Introduction

Recent contributions in the strategy literature have highlighted the role of knowledge management in gaining and sustaining competitive advantage of firms (Kogut & Zander, 1992; Nonaka, 1994). In this stream of literature, human resource management (HRM) practices have been regarded as a critical coordination mechanism to organize knowledge creation, integration, and utilization of firms (Laursen & Mahnke, 2001). In general, it has been widely acknowledged that human resources are of pivotal importance to the creation of sustained competitive advantages of organizations (Colbert, 2004; Laursen & Foss, 2003; Pfeffer, 1998; Subramony et al., 2008). Specifically from the perspective of knowledge management (KM), HRM practices promote a firm's ability to exploit existing knowledge and to generate new knowledge (Lado & Wilson, 1994; Laursen & Mahnke, 2001). Resource Based View (RBV) suggests that organizations are able to create competitive advantage by effectively developing and deploying human resources in ways that add unique value difficult for competitors to imitate (Amit & Schoemaker, 1993; Barney, 1991, 1995; Mahoney & Pandian, 1992; Peteraf, 1993; Wright & McMahan, 1992). In a similar vein, strategic human resource management (SHRM) asserts that employees provide both the foundation for strategy formulation and the means for strategy implementation, thus, HRM activities are instrumental in developing firms' strategic capability (Colbert, 2004; Huselid, 1995; Lauren & Foss, 2003).

As the relationship between HRM and organizational performance has been widely acknowledged, scholars have developed various strategy-based rationales that explain the HRM-performance link (Becker & Huselid, 2006; Bowen & Ostroff, 2004; Lau & Ngo, 2004; Wright & Boswell, 2002). Existing empirical studies in this domain have concentrated on the effects of HRM on productivity (e.g., Bartel, 1994), financial performance (e.g., Gerhart & Milkovich, 1992; Huselid et al., 1997), and labor turnover (e.g., Huselid, 1995). The link between HRM activities and organizational innovation, however, has been largely ignored, although a few

recent studies began to empirically address this issue (Beugelsdijk, 2008; Shipton et al., 2005, 2006). This is rather surprising, given the importance that strategy scholars attach to an organization's ability to innovate in achieving sustainable competitive advantage (Amit and Schoemaker, 1993; Brown & Eisenhardt, 1998; Grant, 1996; McGrath, 2001).

Although the connection between internal functioning of an organization and its innovativeness has certainly never been neglected in the innovation literature (Laursen & Foss, 2004), most attention was directed to top management, organizational structure, job design, and culture. Moreover, several recent studies that explored the HRM-innovation link appear to suffer from limitations from cross-sectional research design, small sample sizes, and/or the use of dummy variables indicating the presence/absence of various HRM activities (Beugelsdijk, 2008; Shipton et al., 2005, 2006). Moreover, existing empirical studies have focused on the direct effects of HRM on organizational innovation, thus leaving the reason why some HRM activities promote innovation unanswered.

The present study contributes to the literatures on strategy, HRM, and organizational innovation by specifying the mechanism through which organizations' strategic HRM efforts, as predominant knowledge strategy of firms, influence their innovative performance. Specifically, we propose that a firm's investment for human resource development (HRD) in the form of corporate training and financial support for education influences its innovative performance by increasing the various types of learning activities engaged by its employees. Innovation researchers have claimed that learning processes that involve employees' exchanges of ideas and knowledge are critical determinant of innovation because innovation often results from a firm's ability to utilize existing knowledge and its ability to generate different combinations and reconfigurations of existing knowledge (Cantner et al., 2008; Collins & Smith, 2006; Laursen & Foss, 2003; Laursen & Mahnke, 2001). We further identify a moderator that may change the strength of the association between various learning practices and organizational innovation. To

this end, we propose that the link between learning and innovation will be strengthened under organizational climate that is supportive of innovation (Bowen & Ostroff, 2004; Klein & Sorra, 1996).

We validate the present conceptual framework using a sample of 222 Korean organizations representing diverse industries. Employing a sophisticated approach to assess companies' HRM activities and learning practices, we used multi-item scales reported by both executives and employees with sound psychometric properties. The outcome variable, organizational innovation, was operationalized as the number of patents registered that has been widely recognized as an important indicator of a firm's innovative performance (Ahuja, 2000; Andersson & Ejermo, 2005). Instead of the organizations' past or current innovative performance, we focused on organizational innovation over the two-year period following the measurement of its HRD investment, learning, and innovative climate, thus examining the longitudinal effect of the predictors on innovation. All in all, the present research makes meaningful empirical contributions as well as theoretical contributions to the literature.

Conceptual Framework

Linking SHRM and innovation, this interdisciplinary study advances a theoretical framework that explains the way HRM activities contribute to innovative performance of organizations. We propose that a firm's HRD investment such as corporate training and financial aid to support their employees' professional development may enhance its innovative performance by stimulating various types of learning activities among its employees. Beugelsdijk (2008) showed that HR practices such as task autonomy, training/schooling, and performance-based pay are positively associated with organizational innovation as measured by the share of new products in total sales. Similarly, Shipton et al. (2006) reported positive effects of HRM practices such as training, teamwork, and job rotation on product innovations in 22 manufacturing firms.

However, the reason for the link between various types of HRM practices and organizational innovation has not been clearly established.

Innovation scholars have emphasized the role of learning and knowledge management in various stages of innovation such as problem identification, idea generation, idea promotion, and implementation (Amabile, 1996; Shalley et al, 2004; Nonaka & Takeuchi, 1995). Organizational learning comprises a central process for innovation that supports the absorption and utilization of external knowledge and integrates it with internal knowledge by allowing effective transfer and creation of knowledge among organizational members (Beugelsdijk, 2008; Laursen & Mahnke, 2001; Shipton et al., 2005). In this study, we are particularly attuned to the various forms of learning that represent individual, interpersonal, and organization-wide practices related to learning. Given that organizations' HRD investment is intended to improve employee skills, abilities, and knowledge, HRD investment may invigorate various learning practices, which in turn lead to organizational innovation and performance. Finally, the present model depicted in Figure 1 also suggests that the link between learning and innovation may be more pronounced in organizations with more innovative climate. Below we explain each of the relationships proposed in our framework in more details.

Insert Figure 1 here

Positive Effect of HRD Investment on Organizational Innovation

It has been widely acknowledged that investing in employees is one of the best ways to improve organizational performance including innovation (Allen et al., 2003; Becker & Huselid, 2006; Beugelsdijk, 2008; Bowen & Ostroff, 2004; Collins & Smith, 2006; Laursen & Mahnke, 2001). Based on the premise that human resources provide a unique source of firm-specific competitive advantage difficult for competitors to replicate (Barney, 1991; Huselid, 1995; Wright &

McMahan, 1992), strategy scholars have focused on the issue of developing and utilizing human resources through distinct HRM practices (Koch & Mcgrath, 1996; Lau & Ngo 2004; Wright & Boswell, 2002). One of the key HRM practices targeted at building competitive human capital is *HRD (human resource development) investment*, which refers to an organization's resource allocation in activities and programs designed to improve employees' knowledge and work-related competence (Subramony et al., 2008). In this study, we identified two main HRD investment factors: corporate training and financial support for education (Laursen & Foss, 2003; Marchington & Grugulis, 2000).

***Corporate training*.** There is no doubt that training has been recognized as a predominant tool for developing human resources (Collins & Smith, 2006; Lau & Ngo, 2004; Marchington & Grugulis; Valle et al. 2000; Souitaris, 2002). Considering that individuals' domain-relevant skills and expertise are meaningful predictors of employees' creative process of generating new and useful ideas (Marchington & Grugulis, 2000), corporate training may better prepare employees to be creative, leading to increased overall innovative performance of the organization. Knowledge management literature clearly indicated that knowledge is embedded in employees and it is difficult to be procured from the market (Amit & Schoemaker, 1993; Barney, 1991, 1995; Koch & Mcgrath, 1996). Corporate training is designed and delivered to employees in various formats (e.g., lectures, workshops, site visits, case analysis) as well as through various media (e.g., collective, face-to-face training, personalized online training) (Bartel, 1994; Delaney & Huselid, 1996). Through social interactions among organizational members and combinations of their knowledge, both internal and external corporate trainings foster employees' creative process of generating new and useful ideas, leading to knowledge creation and increased overall innovative performance of the organization. (Marchington & Grugulis, 2000; Nonaka & Takeuchi, 1995). In addition, given that knowledge is a core element to generate innovation through new combinations and reconfigurations of existing components (Kang et al., 2007;

Laursen & Foss, 2003; Laursen & Mahnke, 2001), expanding both the depth and the breadth of knowledge bases of employees through corporate training has clear strategic importance for organizational innovation.

Hypothesis 1: Corporate training is positively related to organizational innovative performance.

Financial support for education. Another common form of HRD investment is financial support for employees' education and professional development efforts (Marchington & Grugulis, 2000; Pfeffer, 1998). Unlike corporate training that is designed to improve task skills and competencies that are immediately applicable to the job, financial support for education can be directed to employees' self-development efforts in the form of attending colleges or graduate schools for continued education or taking courses that may have either personal or professional implications. By encouraging and providing resources to employees who take personal education outside the organization, organizations may enhance their members' basic task capabilities and general knowledge, which should facilitate creative processes among them (Laursen & Foss, 2003). In addition, when the organization offers resources to help its members' personal and professional development, employees may perceive that their organization cares about them. Receiving generous financial support for education, employees may develop feelings of obligation toward the organization (Allen et al., 2003; Shore & Wayne, 1993). Therefore, in addition to increased motivation to learn and improve themselves among employees, financial support for education is likely to promote employees' affective commitment to the organization, which tends to engender positive organizational outcomes. This includes increased creativity and employee proactive behavior that are the ultimate source of organizational innovation (Eisenberger et al., 1997; Wayne et al, 1997).

Hypothesis 2: Financial support for education is positively related to organizational innovative performance.

Learning Practices as a Mediator Between HRD Investment and Innovative Performance

Although HRD investment is a meaningful predictor of innovative performance of organizations, HRD investment itself may not guarantee innovative performance. Considering that effective transfer, integration, and utilization of knowledge is a core process of innovation (Beugelsdijk, 2008; Lau & Ngo, 2004; Shipton et al., 2006), HRD investment may result in increased innovation *only when* it actually instigates greater sharing and utilization of increased knowledge among employees. In particular, as innovation has been regarded as a path-dependent result of continuous reconfiguration and assimilation of knowledge (Cantner et al., 2008; Laursen & Mahnke, 2001), scholars have recognized learning as an integral process for generating innovation (Nonaka & Takeuchi, 1995). In this study, we define learning practices as "complementary processes that promote the effectiveness of creating, transferring, processing and utilizing of information and knowledge of firms" (Shipton et al., 2005).

Researchers have attempted to identify specific learning practices through which organizations can effectively utilize and combine employees' competences to enhance organizational innovation (Huselid et al., 1997; Laursen & Foss, 2003; Marchington & Irena Grugulis; Rousseau, 1997). We propose three such learning practices in organizations: individual, interpersonal, and organizational learning practices. Individual learning practices involves self-started learning processes based on individual project and self learning, typically through books or manuals. Interpersonal learning practices are based on interpersonal exchanges of ideas and knowledge through mutual learning, coaching, and on-the-job training among employees. Organizational learning practices involve organization-wide systems that encourage knowledge generation and transfer among members, such as six-sigma activities, suggestion program, and quality circles.

As shown in Figure 1, we expect that unless HRD investment accrues its intended benefit through increased learning practices in organizations, it may fail to contribute to

organizational innovation. Thus, we hypothesize a complete mediation of the relationship between HRD investment and organizational innovative performance by learning practices. It is plausible to assume that HRD investment energizes various learning activities in organizations. For example, corporate training and financial support for education should increase employees' motivation for learning and advancing their capabilities, and spur them to engage in various self-learning activities (Collins & Smith, 2006; Frese et al., 1996; Rousseau, 1997). Corporate training sessions provide employees with task-related knowledge as well as meta-knowledge regarding who knows what, increasing their ability to gain/share knowledge within the organization. This indeed will strengthen individual and interpersonal learning practices (Marchington & Grugulis, 2000; Pfeffer, 1998). Corporate training and financial support for education may also generate an overall institutional context for employees that signal the importance of various organization-wide learning programs and that legitimize their participation in those programs (Koch & Mcgrath, 1996). Below we elaborate that each of the three learning practices have significant bearings with regard to organizational innovation.

Individual learning practice. Individual learning practices such as self-learning through work performance (i.e., learning by doing) or engaging in individual task-related project may enhance organizational innovation by expanding the depth and breadth of employee knowledge and thus promoting the process of knowledge creation and utilization (Laursen & Mahnke, 2001). Research shows that personal initiative or proactive involvement at work is a meaningful antecedent of innovative behavior of individuals because they are willing to encounter problems, develop and promote creative solutions, and put them into practice (Frese et al., 1999). An organization filled with self-starters who continually expand their knowledge base should produce greater innovative outcomes than others (Frese et al., 1996, 1997). Thus, individual learning may boost innovativeness of the organization because it is basically a volitional process that demands employees' strong

motivation and initiative to expand their skills and knowledge (Latham & Locke 1991; Rousseau, 1997).

Hypothesis 3: Individual learning practice mediates the relationship between HRD investment and organizational innovative performance.

Interpersonal learning practice. Interpersonal cooperation and communication has been shown to foster creativity and innovative performance (Lau & Ngo, 2004; McDonough, 2000). Interpersonal learning practices, such as mutual learning among employees and coaching, are likely to facilitate knowledge diffusion, which allows employees to bring together knowledge that hitherto existed separately or dispersed across function, and ultimately to make new combinations enhancing creative problem solving (Pini & Santangelo, 2005; Souitaris, 2002). It generates communication codes and combinative capabilities among employees (Kogut & Zander, 1992). This strategic conversion creatively combines and blends a variety of knowledge (Laursen & Mahnke, 2001, p.7). Free flow of a wide range of information and knowledge shared among employees should also upgrade the organization's sensitivity (and thus responsiveness) to changes in the market and technology, which often becomes a major reason for new product development and turnover of existing lines of products and services (Cantner et al., 2008; Nonaka & Takeuchi, 1995). Interpersonal learning practice, thus, continuously reorganizes the knowledge base of the firm and increases its sensitivity to environmental events, which should enhance its innovative performance (Grant, 1996; Rousseau, 1997).

Hypothesis 4: Interpersonal learning practice mediates the relationship between HRD investment and organizational innovative performance.

Organizational learning practice. Organizational learning practices such as suggestion system, six-sigma, and the use of task forces effectively encourage employees' participation in organizational innovation process and inspire employees to improve status

quo instead of passively accepting it (Shipton et al., 2005). Through various organizational learning practices, knowledge transfer and knowledge generation by employees may be recognized as routine and regarded as a regular part of their work (Amabile, 1988; Frese et al., 1999). In addition, similar to interpersonal learning practice, organizational learning practice promotes employees to share their work-related knowledge as well as their vision that reinforces their commitment to collective efforts toward the betterment of the product and services offered by the organization (Harrison & Kessels, 2004). Thus, we hypothesize the following relationship:

Hypothesis 5: Organizational learning practice mediates the relationship between HRD investment and organizational innovative performance.

Innovative Climate as a Moderator

Although we expect to observe a positive association between learning practices and organizational innovative performance in most situations, this link may be more pronounced in organizations with more innovative climate than in those with less innovative climate. Organizational climate reflects employees' overall perception of or meaning attached to the organization based on its relatively enduring features such as practices, policies, and systems (Schneider & Reichers, 1983). Organizational climate thus affects employees' sense making processes with regard to what is appropriate to do and how to proceed to do it. Despite its potential benefit for organizational performance, innovation and creative ideas often "challenge the status quo and disrupt the interpersonal relations and work process endorsed by others… For this reason, employees may need to feel protected or even encouraged by the entire organization when they take risks in suggesting improved work procedures and policies that may create tension with others in the work unit" (Choi, 2007, p. 472). Innovative climate offers this safety net for employees' risk taking in exploring new approaches and expressing out of the box ideas. Under strong innovative climate, employees

understand that new ideas are routinely accepted rather than rejected, and rewarded rather than punished (West & Richter, 2008). Innovative climate thus generates employees' tendency to be curious, cognitively flexible, risk-taking, and persistent in the face of barriers (Amabile, 1996; Lau & Ngo, 2004; Shalley et al., 2004; Zhou & Shalley, 2003).

Considering the substantial role of innovative climate in shaping employee behavior relevant to innovation process, the relationship between learning practice and innovative performance may be attenuated when the climate of the organization is not favorable toward innovation. Under weak innovative climate, employees' motivation for innovation is stifled and various learning practices may strengthen the existing routines already developed and validated, resulting in increased coordination and reliable operation with the status quo (Shalley et al., 2004; West & Richter, 2008; Zhou & Shalley, 2003). The value of various learning practices in regard to generating innovative performance will be unleashed when employees collectively shared the organizational image that it is a place in which innovative ideas are valued and there will be no repugnant reactions toward half-baked ideas. We, therefore, propose the following moderation hypothesis.

Hypothesis 6: Innovative climate moderates the relationship between learning practice and innovative performance, in such a way that the relationship is stronger in organizations with stronger innovative climate.

Research Method

Sample and Data Collection Procedure

To test the present framework, we used the Human Capital Corporate Panel (HCCP) data that included a corporate survey data collected in 2005 and each organization's patent registration information for the period of 2006-2007 as archived by KIPO (Korean Intellectual Property Office). The survey was carried out by KRIVET (Korea Research Institute of Vocational Education and Training) in cooperation with the Ministry of Labor in Korea with the goal of

suggesting the directions for corporate HRD (Human Resource Development) efforts and enhancing national competitiveness by understanding the effects of HRM on organizational performance. KRIVET conducted a pilot study to pre-test the survey design and instruments in 2004.

The sample for the corporate survey was drawn from the entire population of companies with 100 or more employees (N = 7,246). Excluding industries in which HRM activities may not have important implications for organizational performance (e.g., agriculture and mining industries) as well as non-profit and government-related organizations, the initial sample included 1,851 companies. These companies represent three types of industries that represent 16 specific businesses: manufacturing (10 industries, e.g., electronics, computer, chemical, machinery, plastic), banking (1 industry, banking/insurance), and non-banking service (5 industries, e.g., telecommunication, software/system/online DB, entertainment). From the initial list of 1,851 companies, stratified random sampling was performed taking into account the industry, organization size, and organization type (public vs. private), which resulted in a final sample of 454 organizations.

Over a period of six months, data were collected from 11,301 organizational members of 454 companies representing manufacturing (N = 303), banking (N = 35), and non-banking service industries (N = 116). The average number of participants per organization was 28.86 (SD =18.05) and the participants included 82.5% male with an average age of 39 (SD =9.87) and average organizational tenure of 10.26 year (SD =7.00). In each organization, senior managers or directors of strategy, HRM, and HRD were also contacted to obtain information within their domain of work.

Since the goal of the present study was to examine the association of HRD and learning practices with organizational innovative performance, we matched the 2005 corporate survey data with patent registration data in 2006 and 2007. Of the 454 organizations, we decided to

exclude companies that were in banking industries, since the number of patent may not be crucially important to organizational innovative performance in these companies than those of companies in manufacturing and non-banking service industries. The sample, thus, included 419 companies representing manufacturing industries (N = 303) and non-banking service industries (N = 116). Of these 419 organizations, only 222 appeared in the patent data with one or more registered patents. We, again, decided to exclude those companies that were not in the registered patent data for both substantive and empirical reasons. First, the organizations with no patent registration comprised almost a half of the initial sample. Having a half of the entire sample with the same outcome value of zero will substantially reduce the sensitivity of our statistical analysis. Second and more importantly, patent is only one form of organizational innovation that may not properly capture innovative activities operating in different industries and in different market offering different products and services. For this reason, those 197 companies with no registered patent over the two year period can be a mixture of completely un-innovative firms and those who were innovative but did not file their innovative outcomes in patents. Given that it is almost impossible to tease different types of organizations apart and they comprise almost a half of the sample, we decided that it would be better to exclude them from our analysis rather than taking the risk of combining "apples and oranges."

Our final analysis sample, thus, included 7,133 organizational members of 222 companies representing manufacturing industries (N = 175) and non-banking service industries (N = 47). On average, there were 32.13 (SD =20.54) participants per company that included 82.6% male with an average age of 39.8 (SD =7.86) and average organizational tenure of 12.3 year (SD =6.95). This final sample included 1,449 team leaders (20.3%), 523 production managers (7.30%), 2,141 office workers (30.0%), and 3,020 manufacturing workers (42.3%).

Measures

We empirically tested the current hypotheses using multi-source data. The company's HRD director rated the scales of HRD investment and learning practices. Employees reported on innovative climate of their organization. The company's strategy director rated control variables regarding the organization's business environment. All variables were rated on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Patent registration (Korean Intellectual Property Office). The present outcome of organizational innovative performance was operationalized as the number of patents registered over the two years following the corporate survey at 2005. The validity of the patent data as a measure of innovative performance has been confirmed by a number of studies in the innovation literature (Beaudry & Breschi, 2003; Brouwer & Kleinknecht, 1999; Shan et al., 1994; Peeters & Pottelsberghe, 2006). To this end, the 2005 corporate survey data was matched with each company's patent information in years 2006 and 2007 as archived by KIPO. The average number of registered patents in our final sample of 222 companies was 80.74 (*SD* = 615.86).

Corporate training (HRD Director). To assess the degree of corporate training, we operationalized per capita cost of task-related employee training to organizational size.

Financial support (HRD Director). The extent to which the company provided financial support for education was measured by per capita financial support for college or graduate school tuition to the total number of employees supported by organizations. ***Individual learning practice (HRD Director)***. Employees' individual learning practice was assessed by the following three items (α = .70): "Employees in our company actively engage in the following activities: (a) individual project related to one's task, (b) self-learning through performing one's task, and (c) individual problem solving."

Interpersonal learning practice (HRD Director). Drawing on prior studies (Huselid et al., 1997; Guthrie, 2001; Laursen & Foss, 2003), we constructed a four-item scale (α = .70) to

measure interpersonal learning practice. This scale included the following four items: "Employees in our company actively engage in the following activities: (a) mutual learning among employees, (b) mentoring/coaching, (c) task rotation among employees, and (d) on-the-job training."

Organizational learning practice (HRD Director). Based on organizational learning practices appeared in existing studies (Huselid et al., 1997: Lau & Ngo, 2004; Laursen & Foss, 2003), we used a five-item measure (α = .90) to assess practices/systems for organization-wide learning: "Employees in our company actively participate in the following programs: (a) task forces, (b) quality circles, (c) suggestion system, (d) six-sigma, and (e) knowledge mileage program."

Innovative climate (Employees). Based on the existing studies (Choi, 2007; Patterson et al., 2005), innovative climate was assessed by the following five items (α = .71): (a) "In our company, all employees have opportunities to express their ideas and opinions," (b) "We have frequent information exchanges across functional departments or teams," (c) "In our company, employees have trusting working relationships," and (d) "Executives in our company tend to be authoritarian and do not accept others' ideas." These items were rated by team leaders, production managers, and employees. Because the unit of analysis for this study was the organization, employee ratings of innovative climate were aggregated to the organizational level. This scale exhibited acceptable interrater agreement ($r_{wg(4)}$ = .85), suggesting that employees of the same organization possessed shared perceptions of innovative climate. In addition, this scale also produced acceptable levels of intraclass correlations (ICC(1) = .09, ICC(2) = .77, F = 4.32, p < .001), indicating that there is substantial between-organization variation and the organization-level aggregated score of innovative climate to render a reliable estimate of the construct at the organization level (Chen et al., 2004).

Control variables (Strategy Director). Examining prior studies of organizational innovation, we identified macro-level factors that may have implications for organizational innovation. In our analysis, we controlled for the effects of the following five factors including both the firm-specific factor and environment-specific factors: (a) industry type, (b) organization size, (c) competition, (d) market change, and (e) technology change. Organizations in our sample were drawn from 15 industries: 10 manufacturing industries and 5 non-manufacturing industries that likely face different market and technology conditions. We, therefore, controlled for industry differences with effects dummy coding in our analysis (0 = non-manufacturing industry, 1 = manufacturing industry). Organization size has been acknowledged as a critical firm-specific factor that affects innovative performance (Koch & McGrath, 1996; Laursen & Foss, 2003; Shipton et al., 2005). In the present data, organization size was indicated by a scale with four categories indicating the number of employees (1 = 100-299; 2 = 300-999; 3 = 1000-2999; 4 = above 3000). The innovation literature also emphasized the role of external factors in driving organizational efforts to innovate. In this study, to control for the effects of environment-specific factors, we included the extent of competition (Stelzer, 2002), market change, (Langerak et al., 2007), and technology change (Benamati & Lederer, 2001). The extent of competition was measured by an item "How many domestic competitors do you have" (1 = *none*; 2 = *1-2*; 3 = *3-4*; 4 = *5-9*; 5 = *more than 10*). Market change was measured by an item, "In our business, it is very hard to predict change in market and consumer demand" (1 = *strongly disagree*; 5 = *strongly agree*). Technology change was assessed with an item: "To what extent did your company experience technological changes in the last three years?" (1 = *not at all*, 5 = *a great deal*).

Results

Descriptive statistics and correlations among all study variables are reported in Table 1. In the present study, structural equation modeling (SEM) was employed to statistically test our research

model. SEM provides an adequate analytic procedure for the present research model that involves multi-step predictive relationships with multiple mediators, which requires a large number of regression equations. SEM allows an omnibus test of all hypothesized relationships simultaneously taking into account shared variances among all variables (Bentler, 2006).

Insert Table1 here

Hypothesized Models and Plausible Alterative Models

We first fit the hypothesized model as shown in Figure 1 by testing structural relations among the constructs. In this initial structural model, we included all four control variables (organization size, competition, market change, and technology change). Because the moderating effect of innovative climate was tested, all learning practice variables and innovative climate were mean-centered to reduce the problem of multicollinearity (Katrichis, 1993). The main effect of innovative climate on innovative performance was also included. This hypothesized model exhibited a marginally acceptable model fit (χ^2 (df = 43) = 96.27, p = .000; CFI = .92; RMSEA= .075; AIC = 250.27)to the observed structural relations among variables (Hu & Bentler, 1999). Adapting the SEM practice to consider the possibility that theoretically plausible alternative models provide a better explanation observed in the present data, we tested several alternative models.

Table 2 shows the model fit information of three such alternative models. In the first alternative model, we tested if the mediation by learning practices was not complete. We, thus, added two direct paths from HRD investment factors to innovative performance. This partial-mediation model produced a very good fit (χ^2 (df = 41) = 61.41, p = .021; CFI = .97; RMSEA= .047; AIC = 219.41). The chi-square difference test indicated that this alternative model

significantly improved the fit of the hypothesized model ($\Delta\chi^2$ (Δdf = 2) = 34.86, p < .001). In the second alternative model, we checked for the possibility that HRD investment and learning practices have parallel effects on innovative performance instead of having a mediated relationship. This model produced worse model fit (χ^2 (df = 45) = 92.42, p = .000; CFI = .93; RMSEA= .069; AIC = 242.42) than that of the second alternative model. Finally, the third alternative model further tested the possibility that innovative climate interacted with HRD investment in predicting innovative performance instead learning practices. The model fit of this model (χ^2 (df = 39) = 79.86, p = .000; CFI = .96; RMSEA= .069; AIC = 211.86), produced significantly worse than that of the hypothesized model. Hence, we opted for the second alternative model which provided the best fitting, theoretically plausible explanation of the data.

Insert Table 2 here

Hypothesis Testing

The SEM results of the partial-mediation model are presented in Figure 2 with standardized path coefficients. Among control variables, market change and technology change were significant predictors of the number of registered patents over the following two years (β = .15 and .14, respectively, both p < .05).

Insert Figure 2 here

Among the three learning practices, interpersonal and organizational learning practices significantly increased innovative performance of organizations in the form of the number of patents registered (β = .27, p < .05 and β = .05, p < .10, respectively). However, the effect of individual learning practice on innovative performance was not significant in the present data.

The SEM results also showed that both HRD investment factors were statistically meaningful predictors of learning practices. Corporate training showed a strong positive effect both on interpersonal and organizational learning practices (β = .13 and .18, respectively, both $p < .01$). Financial support for education was positively associated with interpersonal learning practice (β = .15, $p < .001$). Overall pattern of results indicated that among three types of learning practices, interpersonal and organizational learning practices mediated the effects of HRD investment on innovative performance (Hypotheses 4 and 5 supported). Both corporate training and financial support for education had positive indirect effects on innovative performance via their direct effects on learning practices (Hypotheses 1 and 2 supported). However, they remained to be a highly significant predictor of innovative performance even after controlling for its effect via learning processes. Corporate training showed a strong direct effect on innovative performance (β = .34, $p < .001$). Surprisingly, however, the direct effect of financial support for education on innovative performance was negative (β = -.24, $p < .001$). This counterintuitive pattern will be discussed later.

We also tested for the moderating role of innovative climate. Although innovative climate did not show any main effect on innovative performance, it did significantly moderate the relationships between interpersonal and organizational learning practices and innovative performance (β = .32, $p < .01$ and β = .15, $p < .05$, respectively), partially confirming Hypothesis 6. To interpret the interactions, we conducted separate regression analyses for two subgroups composed of members of organizations with either high (1 *SD* above the mean) or low (1 *SD* below the mean) innovative climate (Aiken & West, 1991). The two plots displayed in Figure 3 reveal that the positive effects of interpersonal and organizational learning practices on innovative performance were stronger when employees were in organizations with high innovative climate, whereas, innovative performance was weakly influenced by learning practices with low innovative climate. All in all, the data support the critical mediating role of

interpersonal and organizational learning practices and the moderating function of innovative climate in predicting innovative performance in organizations.

Insert Figure 3 here

Discussion

Strategy scholars have emphasized the function of knowledge creation and utilization as a significant source of competitive advantage of firms (Kogut & Zander, 1992; Nonaka, 1994; Laursen & Mahnke, 2001). In particular, HRM practices that allow a firm to develop more competent and high-performing employees than its competitors are apt to contribute to the effectiveness of knowledge creation, integration and utilization (Lado & Wilson, 1994; Huselid, 1995). In this context, researchers of various disciplines have highlighted the strategic value of HRM in fostering non-imitable idiosyncratic resources for competing in dynamic environment (Cantner et al., 2008; Huselid, 1995; Ichniowsk et al., 1997; Laursen & Foss, 2003). Despite the prevalence of strategic perspective and discourse regarding HRM, as Becker and Huselid (2006) pointed out, the linkage between HRM activities and competitive advantage of organizations still remains too indirect and ambiguous to guide empirical studies or to offer managerial insights. Departing from existing SHRM studies principally focused on classic HR issues such as productivity, financial performance, and turnover (e.g., Huselid et al., 1997), the present study put forward theoretical propositions and empirical analysis that explicate the mechanism through which a company's HRD practices affect its innovative performance. This study is one of the first empirical examinations of the link between HRM activities and innovation in strategy (Beugelsdijk, 2008; Shipton et al., 2005). Below we highlight important findings of the study and their implications, and discuss its limitations along with the future directions for research.

Implications of HRD Investment for Organizational Learning and Innovation

The results showed that HRD investment significantly predicted various learning processes within the company, which in turn increased its innovative performance. Specifically, corporate training was a positive predictor of interpersonal and organizational learning practices. Employees may understand a firm's business from a variety of perspectives and achieve additional insights and intuition that may not be gained from their daily routines by attending training sessions with other members in different functions and different business divisions (Guthrie, 2001; Lauren & Mahnke, 2001; Wayne et al, 1997). In addition, corporate training quite often is geared toward enhancing employees' awareness of new organizational practices such as six-sigma and knowledge mileage program that may also promote their motivation to participate in those programs (Koch & Mcgrath, 1996). Corporate training thus appears to offer increased awareness, motivation, and insights based on mobilized knowledge as well as new task-relevant skills that reinforce employee participation in organization-wide learning practices such as task forces and suggestion programs.

Financial support for education was positively related to interpersonal learning practice. Encouraging and supporting organizational members to continue their personal and professional development by taking courses and enrolling in academic degree programs may create a substantial inflow of knowledge and information, which should stimulate increased learning activities within the company. In addition, employees who received financial aid for their personal education (particularly for degree programs for an extended period of time) may develop a greater sense of organizational support and care, which triggers the feeling of obligation to return the favor by making extra contributions (Allen et al., 2003; Shore & Wayne, 1993). These employees are apt to be proactive and take charge to improve organizational routines and products/services offered by the organization (Eisenberger et al., 1997).

Our data also showed that the effects of HRD investment on innovative performance were only partially mediated by interpersonal and organizational learning practices. Corporate

training and financial support for education had a significant direct effect on innovative performance. Unexpectedly, however, the nature of the influence of financial support for education on organizational innovation was found to be a negative one. Unlike corporate training programs that have a clear focus on task-related skills and introducing organizational changes and values to employees, general academic degree programs may have limited applicability and relevance to specific organizational tasks. In addition, while various forms of company support for employee education such as tuition support for taking courses, financial aid for attending various degree programs indeed enhance employees' personal development and interpersonal learning processes among employees, they may also distract employees from their task at hand. For this reason, after controlling for its contributions via interpersonal learning practice, financial support for education seemed to have negative implications for innovative performance. The results suggest that task-related organizational collective training definitely foster innovative performance of organization. On the other hand, supporting individual-level personal education and development such as supporting employees' degree program outside the organization may have both positive and negative effects for organizational performance.

Implications of Learning Practices for Organizational Innovation

Of the three learning practices examined, interpersonal and organizational learning practices had significant positive effects on innovative performance. Both learning practices involve knowledge sharing, transferring of ideas among members, or expressing ideas through organizational systems or programs, which might reinforce the learning and knowledge generation and assimilation processes (Laursen & Mahnke, 2001; Nonaka and Takeuchi, 1995; Kang et al, 2007). In contrast, individual learning practice was not significantly associated with innovative performance of organizations. This contrasting pattern involving the three learning practices suggests that instead of individual knowledge or activities, collective efforts of organizational members may lead to organizational innovation (Nahapiet & Ghoshal, 1998; Pini

& Santangelo, 2005; Souitaris, 2002). The present finding provides empirical support for the common argument in the knowledge management literature regarding the importance of knowledge that lies in connections between individuals (cf. situated knowledge web, Nidumolu, Subramani, & Aldrich, 2001). In generating organizationally meaningful innovations such as registered patents, collective processes based on communities of practice, distributed expertise, and processes that link individuals and groups/communities seem to play a lot more critical role than knowledge embedded in individual employees (Nidumolu et al., 2001). Perhaps, learning practices promote innovation to the extent that they establish context in which employees collectively create and transfer knowledge through social interactions (Shipton et al., 2005).

The results also indicated that even those collective organizational learning processes may not be effective in generating innovation when the overall organizational context was not supportive of innovation. Thus, innovative climate operated as a critical enabler for interpersonal and organizational learning practices to engender organizational innovation. In addition to the main effect of innovative climate on innovative behavior and creativity (Choi, 2007; Lau & Ngo, 2004), this study also demonstrated that innovative climate is a meaningful contextual factor that determines the significance of learning processes in regard to organizational innovation.

Study Limitations and Future Research

The present research design has several strengths such as multi-source, longitudinal data, multi-item scales with sound psychometric properties, and the use of objective indicator of innovative performance, all of which allowed a rigorous empirical validation of our conceptual model. This study, however, also have several limitations. First, the present data included organizations representing various industries, which increases generalizability of the findings, but also may ignore potential sources of confounding because each industry may have different innovation-related dynamics. For example, the meaning and significance of patent registration may widely vary across industries. The same is true for the role of HRD investment and learning practices in

generating innovation. Second, although the outcome (patent registration) was collected over a two year period after the corporate survey, all predictor and moderator variables were collected at the same time and the causal directions among them may not be definite. For instance, the prevalence of learning processes may either increase or decrease HRD investment, and innovative climate can be an antecedent of learning practices. Finally, the data was collected from Korean organizations often characterized by distinct organizational culture and managerial practices (Lau & Ngo, 2004). The present findings may need to be validated with data from other cultural contexts.

Nevertheless, this study addressed a critical issue for both strategy and SHRM researchers and explicated the HRM-innovative link that has been neglected in the literature. The present conceptual framework and empirical data provide a clear picture of the mechanism through which HRM efforts of organizations enhance their innovative performance. In so doing, we admit, the scope of the study became limited to a small number of specific HRD and learning practices. Future studies may expand and enrich the present conceptual model with additional HRM activities and learning and knowledge management practices. In addition, as suggested in some of previous studies (Beugelsdijk, 2008; Shipton et al., 2005), researchers may develop a matrix of relationships between different types of learning practices and different types of innovations. For example, HRM or learning practices beneficial for incremental, process innovation may differ from those beneficial for radical, product innovation.

Practically speaking, this study provides several valuable suggestions for organizations that are under continuous pressure to innovate. Corporate investment in HRD is necessary to develop competent knowledge workers who will work together to produce innovation. However, organizations may need to carefully manage and select the content of education programs for their employees to ensure transferability and applicability of the education experience to organizational tasks (Noar & Zimmerman, 1997). In addition, given the potential negative effect

of financial support for education on innovation, managers may need to find a way to minimize employee distraction from their work during an extended period of academic education. To be innovative, organizations may need to encourage collective learning processes (instead of individual-focused, isolated learning) that facilitate transfer and generation of knowledge among members. Finally, considering the significant moderating effect of innovative climate and the very weak association between learning practices and innovation under low innovative climate, it is clear that learning practices and innovative climate should present simultaneously (instead of either one or the other) to promote innovation. All in all, this study highlights the importance of internal structure and functioning, particularly HRM, learning, and climate, in regard to the organization's innovative capability and performance.

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Table 1 Means, Standard Deviations, and Correlations Among Study Variables

Variables	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1. Industry Type	.79	.41	--											
2. Organization Size	854.96	918.02	.08	--										
3. Competition	3.34	1.12	-.23**	-.12	--									
4. Market Change	2.89	.77	.04	.07	.04	--								
5. Technology Change	3.27	.75	.10	.05	-.15**	.11	--							
6. Corporate Training	.55	.92	.05	.37**	-.22**	.06	.07	--						
7. Financial Support for Education	8.41	11.47	-.07	.17*	-.12	.06	.06	.27**	--					
8. Individual Learning Practice	3.22	1.14	.09	.11	-.10	.09	-.01	.05	.01	--				
9. Interpersonal Learning Practice	3.27	1.11	.08	.17*	-.16*	.20**	.01	.12	.06	.55**	--			
10. Organizational Learning Practice	3.39	.77	.18*	.22**	-.11	-.12	.13**	.17*	.07	.03	.08*	--		
11. Innovative climate	3.20	.29	-.20**	.21**	-.07	-.04	.03	.22**	.22**	.07	.20**	.15**	--	
12. Patent Registration	80.74	615.86	.06	.26**	-.08	.16*	.19**	.40**	-.02	.08	.11	.18**	.11	--

Note. Unit of analysis is organization (N = 222)

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

Table 2 Comparison of Model Fit of Alternative Models

Model	χ^2 (*df*)	*p*	CFI	RMSEA	AIC
Hypothesized Model	96.27 (43)	.000	.92	.075	250.270
Alternative Model 1: Direct effects of HRD investment on innovative performance (partial mediation model)	61.41 (41)	.021	.97	.047	219.413
Alternative Model 2: Parallel effects of HRD investment & learning practices on innovative performance	92.42 (45)	.000	.93	.069	242.415
Alternative Model 3: Interaction effects of HRD investment and innovative climate on innovative performance	79.86 (39)	.000	.96	.069	211.857

Note. CFI = Comparative Fit Index. RMSEA = Root Mean-Square Error of Approximation. AIC = Akaike Information Criterion.

Figure 1 Theoretical Framework of Organizational Innovative Performance

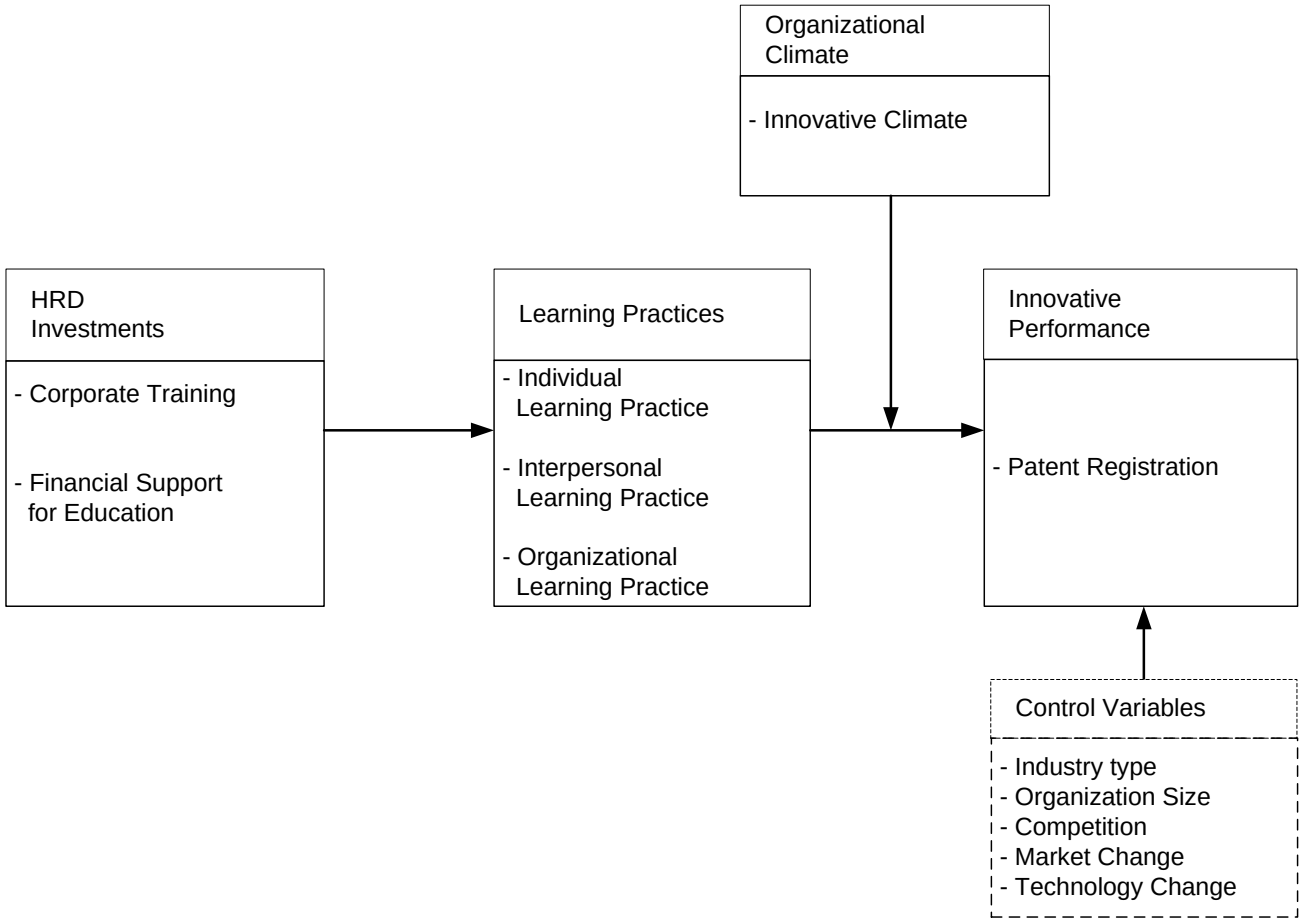
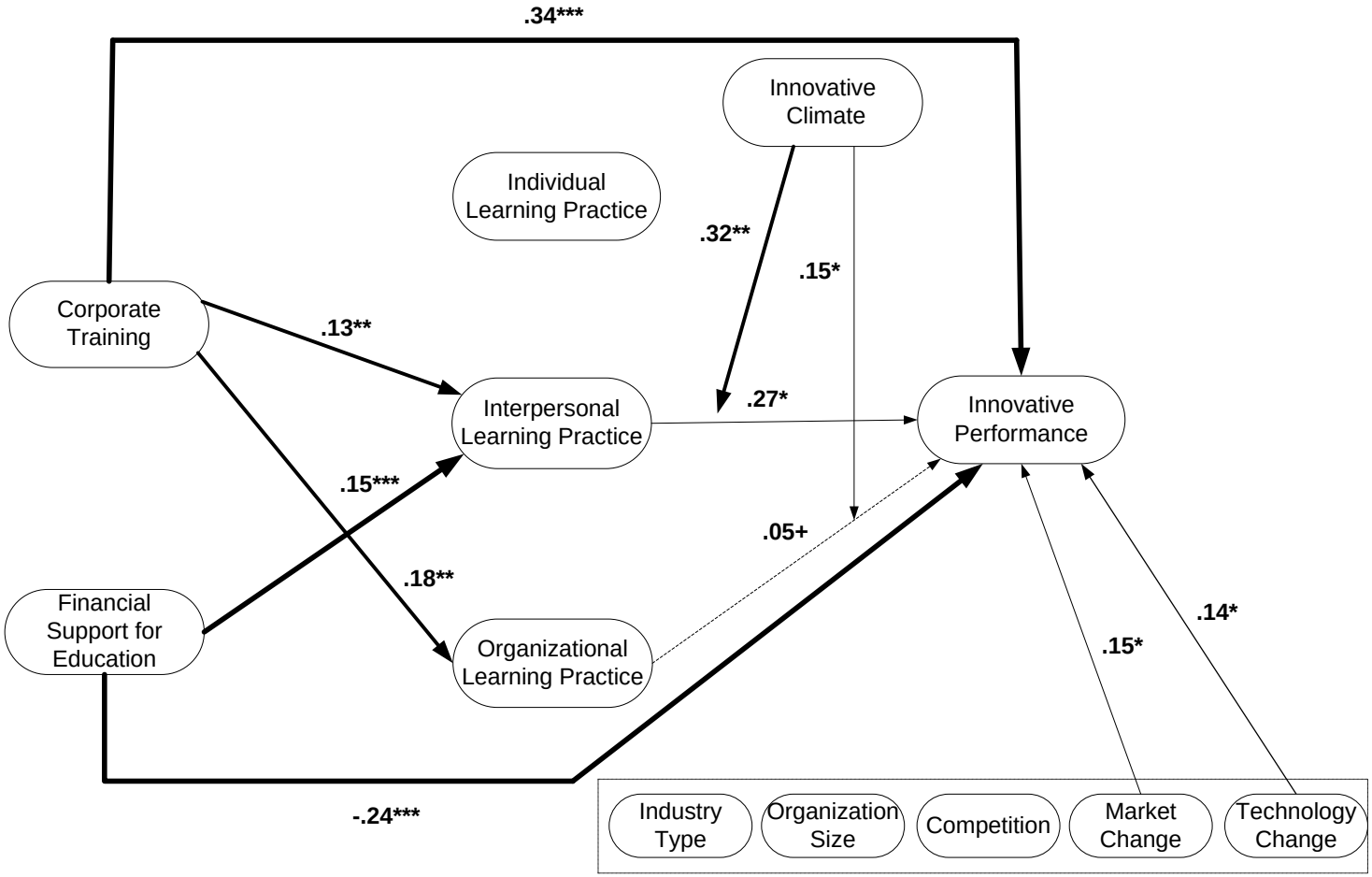


Figure 2 Final Structural Model Predicting Organizational Innovative Performance



Note. Thicker lines represent statistically more significant results. Insignificant paths are not depicted in the diagram.

+ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Figure 3 Interaction Between Innovative Climate and Learning Practice in Predicting Organizational Innovative Performance