

# Do organizations spend wisely on employees? Effects of training and development investments on learning and innovation in organizations

SUN YOUNG SUNG<sup>1</sup> AND JIN NAM CHOI<sup>2\*</sup>

<sup>1</sup>*School of Business, Nanjing University, Nanjing China*

<sup>2</sup>*College of Business Administration, Seoul National University, Seoul, Korea*

## Summary

The present study examines the effects of training and development on organizational innovation. We specifically suggest that the training and development investments of an organization affect its innovative performance by promoting various learning practices. We empirically tested our hypothesis by using time-lagged, multi-source data collected from 260 Korean companies that represent diverse industries. Our analysis showed that corporate expenditure for internal training predicts interpersonal and organizational learning practices, which, in turn, increase innovative performance. The data also revealed that the positive relationship between interpersonal and organizational learning practices and innovative performance is stronger within organizations that have stronger innovative climates. By contrast, investment in employee development through financial support for education outside an organization poses a significant negative effect on its innovative performance and no significant effect on learning practices. The present study provides a plausible explanation for a mechanism through which the investment of an organization in employees enhances its innovative performance. Copyright © 2013 The Authors. *Journal of Organizational Behavior* published by John Wiley & Sons, Ltd.

**Keywords:** training and development investments; learning practices; innovative climate; innovative performance

## Introduction

Increasing endorsements on the strategic value of developing human capital in organizations encouraged scholars to investigate the relationship between training practices and various performance measures (Tharenou, Saks, & Moore, 2007). Empirical studies in this domain focused on the effects of training on productivity (Barrett & O'Connell, 2001), financial performance (Glaveli & Karassavidou, 2011), and employee motivation (Castellanos & Martín, 2011). Unfortunately, the link between training practices and organizational innovative performance has been largely ignored (Nguyen, Truong, & Buyens, 2010). Except for a few recent studies that treat training as a component of effective HR systems (Chen & Huang, 2009; Shipton, West, Dawson, Birdi, & Patterson, 2006), the independent effect of training on organizational innovation has yet to be investigated (Tharenou et al., 2007). This is rather surprising, given the prevailing emphasis of a firm's innovative capability in achieving competitive advantage and sustainable growth (Kang, Morris, & Snell, 2007; Lau & Ngo, 2004). To address this gap, the present study investigates the effects and underlying mechanisms of the investment in developing human resources on organizational innovation.

Innovation often results from the ability to utilize existing knowledge and information to generate different combinations and reconfigurations (Cantner, Kristin, & Schmidt, 2008). The training and development investments

\*Correspondence to: Jin Nam Choi, College of Business Administration, Seoul National University, Shinlim-dong, San 56-1, Gwanak-gu, Seoul, 151-742, Korea. E-mail: jnchoi@snu.ac.kr

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

of an organization create a climate for constant learning that facilitates the exchange of knowledge and ideas among employees, thereby promoting the generation of new knowledge and innovation (Lau & Ngo, 2004). Hence, previous studies have often presumed that learning processes are the underlying mechanisms that account for the effects of training on innovative performance (Chen & Huang 2009; Laursen & Foss, 2003). For instance, scholars have argued that training practices enhance innovation through promoting a learning climate (Gómez, Lorente, & Cabrera, 2004; Shipton, Fay, West, Patterson, & Birdi, 2005) and exploratory learning (Beugelsdijk, 2008; Shipton et al., 2006). Theoretical elaboration and empirical evidence remain lacking despite the prevalent presumption regarding the potential intervening role of learning in the training–innovation link.

The current study elaborates the role of learning practices as potential mediating mechanisms, which can explain why organizational efforts to develop human capital affect innovative performance. Considering that learning is a dynamic process that involves multiple organizational levels (Bontis, Crossan, & Hulland, 2002; Noe, Tews, & Dachner, 2010), we examine three types of learning in organizations, namely individual, interpersonal, and organizational learning. In addition, we identify the innovative climate of an organization as a moderating contingency that may change the strength of the association between the three types of learning practices and organizational innovation to contextualize our model with a boundary condition. We specifically propose that the link between learning and innovation is strengthened under an organizational climate that supports and promotes innovation (Choi, 2007; West & Richter, 2008).

In summary, we adopt the input-throughput-output framework employed in recent studies (e.g., Huerta, Audet, & Peregort, 2006; Katou, 2009) to propose various learning practices as potential mediators between the training investment and innovative performance of an organization. In addition, we identify the innovative climate of an organization as a moderator that may change the strength of the association between learning practices and organizational innovation (Bowen & Ostroff, 2004). In empirically validating our theoretical propositions, we address several limitations of recent studies on training and development, such as the reliance on managers as the single source of data and use of cross-sectional research design or post-predictive design, which render ambiguous causal directions (Tharenou et al., 2007). To overcome these limitations, we collected time-lagged, multi-source data over a period of 2 years from a sample of 260 Korean organizations in diverse industries.

## Conceptual Framework

With the increasing emphasis on human capital in relation to innovation (Chen & Huang, 2009; Lau & Ngo, 2004; Laursen & Foss, 2003), existing studies have shown that various HR practices are positively associated with organizational innovation, such as the proportion of new products in total sales (Beugelsdijk, 2008) and product innovations in manufacturing firms (Shipton et al., 2006). However, a detailed explanation on why these HR practices affect organizational innovation has not yet been clearly established.

In the present study, we explore the issue by focusing on organizational training and development investments as a key HR practice. Scholars and practitioners identified individuals as ultimate sources of creativity and innovation (Amabile, 1996; Choi, 2007). Thus, successful development of capable and highly motivated employees is a necessary condition for organizational innovation (Collins & Smith, 2006). Investing in the training and development of employees is an effective method to develop a competitive human resource pool (Jacobs & Washington, 2003). Focusing on the input function of training practices, scholars have attended to input-oriented factors such as the availability of training programs (Beugelsdijk, 2008; Chen & Huang, 2009) and extent to which an organization provides opportunities for training (e.g., hours of training or the ratio of employees trained; Aragón-Sánchez, Barba-Aragón, & Sanz-Valle, 2003; Glaveli & Karassavidou, 2011). Among these input factors incurred by the company, financial investment is the most straightforward indicator of organizational commitment and resource expenditure related to training (Huerta et al., 2006). Researchers who adopt a resource-based approach argue that

intensive and well-organized corporate trainings are resource dependent and must be supported by appropriate resource input, such as a sufficient budget (Gómez et al., 2004). Along with this stream, the monetary investment of firms in training has been recently highlighted as the most basic requirement to ensure both opportunities and quality of training for employees (e.g., gross payroll expenditure in training, Huerta et al., 2006; percentage of labor costs related to training, Sels, 2002; budget assigned to training, Shipton et al., 2006). Consistent with these studies that employ a resource-based approach, the present study focuses on financial investment in training and development.

This study also examines learning practices as critical intervening processes that account for the link between training and development investments and innovation (Figure 1). Organizational efforts for training and development nurture knowledge and expertise among employees and generate their commitment to learning (López, Peón, & Ordás, 2006; Noe et al., 2010). Organizational learning is a central process for innovation, which promotes the absorption and utilization of external knowledge and integrates internal knowledge by allowing effective transfer and application of knowledge among organizational members (Chen & Huang, 2009; Subramony, Krause, Norton, & Burns, 2008). Similar to a recent study conducted by Di Milia and Birdi (2010), we are particularly attuned to learning that takes place at three levels in organizations: individual, interpersonal, and organizational learning. Training investment may invigorate learning at multiple levels, thereby leading to organizational innovation (Bontis et al., 2002). In addition, the current model suggests that the link between learning and innovation may be more pronounced in organizations with more innovative climates. By investigating the role of climate at the organizational level, the current study expands the literature on climate, which has mostly focused on the role of climate as a promotional context for group performance (González-Romá, Fortes-Ferreira, & Peiró, 2009). Each relationship proposed in the research framework is explained later in detail.

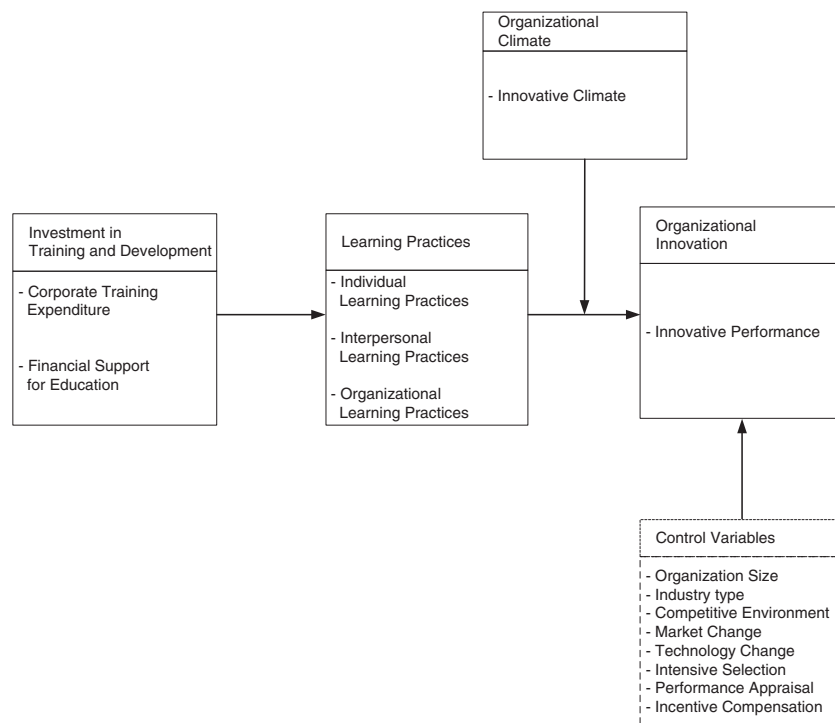


Figure 1. Theoretical framework of organizational innovative performance

### *Positive effects of training and development investments on organizational innovation*

Innovation scholars highlighted the role of active learning and pursuing new knowledge in various stages of innovation, including problem identification, idea generation, idea promotion, and implementation (Nonaka & Takeuchi, 1995; Shalley, Zhou, & Oldham, 2004). Such learning and knowledge management processes can be facilitated through corporate training and development by exposing employees to broad perspectives, skills, expertise, and additional insights through which they can expand their reservoir of new and useful ideas for innovation (Castellanos & Martín, 2011; Nguyen et al., 2010). Addressing the need to clarify the different modes of organization-provided training (Popescu, Popescu, & Iancu, 2010) and considering the different developmental focus, we identify the following two forms of training investment: corporate training expenditure and financial support for education. The former is the preferred investment for firm-specific, intensive internal training for immediate performance gain, whereas the latter is geared toward external education to enhance the general competence of employees from a long-term perspective (Jacobs, Skillings, & Yu, 2000). Although these two forms of training investment may play similar functions in generating learning and ultimately innovation, a separate examination is still important because both forms represent different resource allocation patterns across organizations and different ways through which human resource development efforts enhance organizational innovation.

#### **Corporate training expenditure**

Corporate training expenditure is the investment for firm-specific, internal training that aims to achieve immediate skill building and performance gain, which directly address the current and impending training needs of an organization (López et al., 2006). Organizations allocate resources to initiate training programs that are mostly developed and delivered in-house to provide organization-specific and task-relevant instructions, thus reinforcing firm-specific human capital in a short period (Hatch & Dyer, 2004). This method is designed and delivered to employees in various formats (e.g., lectures, workshops, site visits, and case analyses) and media (e.g., collective face-to-face training and personalized online training; Noe et al., 2010). In addition to supplying new knowledge and information, corporate training promotes fast and effective learning and adaptation to new tasks and situations encountered by employees, thereby increasing employees' openness to innovative ideas and their ability to make constructive proposals for changes that may not be gained from their daily routine (Aragón-Sánchez et al., 2003; Chen & Huang, 2009). Given that intensive and well-organized corporate trainings are resource dependent and must be supported by appropriate investment (Gómez et al., 2004), financial investment in training is critical in ensuring both opportunities and quality training for employees, which should enhance organizational innovation.

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

#### **Financial support for education**

Another common form of training investment is financial support for the education and professional development of employees (Benson, Finegold, & Mohrman, 2004; Jacobs et al., 2000). Unlike corporate training, which is designed to directly improve task skills and competencies customized for a job and an organization, financial support for education is often directed toward the self-development efforts of employees to address their own needs and self-identified goals to improve their overall task-related competence (Bassi & McMurrer, 1998; Jacobs & Washington, 2003). By encouraging and supporting employees who attend external educational and degree programs, organizations can diversify intellectual assets and perspectives that facilitate creativity and innovation (Bassett-Jones, 2005). As employees receive encouragement and generous financial aid for their education, they may also be motivated to engage in proactive initiatives and voluntary contributions toward organizational goals, which are crucial sources of organizational innovation (Rhoades & Eisenberger, 2002).

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

### *Learning practices as mediator between training investment and innovative performance*

Although investment in training and development is a meaningful predictor of innovative performance, the training investment itself may not guarantee such performance. Considering that effective transfer, integration, and utilization of knowledge are core processes required for innovation (Chen & Huang, 2009; Gómez et al., 2004), training investment can result in increased innovation, but only when it actually instigates greater sharing and utilization of knowledge among employees (Bontis et al., 2002; Kang et al., 2007). Innovation is regarded as a path-dependent outcome of continuous knowledge assimilation and reconfiguration (Cantner et al., 2008). Thus, scholars recognized learning as an integral process for generating innovation (Laursen & Foss, 2003; Nonaka & Takeuchi, 1995). In the present study, learning practice is defined as a set of complementary processes that promote the creation, exchange, and utilization of information and knowledge, all of which must be performed to enhance organizational innovation (Hatch & Dyer, 2004).

Organizational learning is a complex and dynamic process that unfolds at multiple organizational levels (Birdi, Patterson, & Wood, 2007; Noe et al., 2010). Thus, adopting the multilevel learning framework (Crossan, Lane, & White, 1999; Di Milia & Birdi, 2010), we propose the following sub-processes of learning in organizations: individual, interpersonal, and organizational. Individual learning practices involve learning activities based on individual projects and self-learning. Individual learning is often carried out through books or manuals and facilitated by training programs to promote individual knowledge. Meanwhile, interpersonal learning practices are based on knowledge exchange and cross-training among employees. Interpersonal learning often occurs at dyad and small group levels through mutual learning, coaching, and task rotations. Finally, organizational learning practices involve organization-wide systems that encourage knowledge transfer and generation among members. Organizational learning practices include knowledge-sharing systems, suggestion programs, and quality circles. In the following section, we elaborate that each of the three learning practices has a significant bearing on organizational innovation, thus mediating the relationship between training investment and innovation.

#### **Individual learning practices**

Training and development investments nurture organizations' overall learning culture (Gómez et al., 2004; Noe et al., 2010), which increases the willingness of employees to advance their capabilities and engage in various self-learning activities. Participation in corporate training and external education programs stimulates employees to become more learning oriented as well as urges them to actively pursue diverse information and knowledge needed to better perform their tasks (Chen & Huang, 2009; Shipton et al., 2006). Individual learning practices, such as self-learning through work performance or engaging in individual task-related projects, may enhance organizational innovation by expanding the depth and breadth of employee knowledge (Sung & Choi, 2012). These practices also promote the personal development and proactive involvement of employees at work, which enhances their capacity to troubleshoot work-related problems, develop creative solutions, and apply these solutions in practical situations. An organization that consists of proactive learners who continually expand their knowledge base produces greater innovative outcomes than others (Birdi et al., 2007).

*Hypothesis 3:* Individual learning practices mediate the relationship between training investment and innovative performance.

#### **Interpersonal learning practices**

Financial investment in training and development conveys a clear message of strong willingness to develop employees, which may generate an overall institutional context that signals the legitimacy of learning (Gómez et al., 2004; Sels, 2002). Collective trainings that offer opportunities for communication among employees from different departments and from the same department stimulate employees to share ideas and experiences (López et al., 2006). Similarly, participation in external education programs should encourage the participants to introduce new trends

and perspectives to other members to justify their time off from regular work hours and tuition support from the organization (Rhoades & Eisenberger, 2002). Under such situations, employees are likely to engage in collaborative interactions, which in turn promote interpersonal learning in the form of active involvement in mutual learning, coaching, and cross-training of each other's task element (Noe et al., 2010). These interpersonal learning incidents at the dyad or small group level may have bottom-up ripple effects for enhancing the overall learning and innovation of an organization (Bollinger & Smith, 2001). Such knowledge-sharing processes instigate employees to create novel combinations of existing knowledge by bringing together knowledge that was not readily connected in the past. Unconstrained interpersonal flow of information and knowledge should also improve the sensitivity and responsiveness of an organization to changes in the market and technology, which are often the major reasons for new product development (NPD) and turnover of existing lines of products and services (Cantner et al., 2008). Therefore, interpersonal learning practices continuously reorganize the knowledge base of an organization and increase its sensitivity to environmental events, thereby enhancing its innovative performance.

*Hypothesis 4:* Interpersonal learning practices mediate the relationship between training investment and innovative performance.

### **Organizational learning practices**

By shaping an overarching environment that supports and promotes learning, training and development investments provide a foundation for readiness and activation of learning and knowledge management within organizations (Huerta et al., 2006; Noe et al., 2010). Such an organizational context encourages employees to engage in various organization-wide learning practices, such as knowledge-sharing systems, suggestion programs, and cross-functional task forces, to resolve urgent organizational problems. These organizational practices are broader in their scope compared with interpersonal learning on the dyad or small group level, thus facilitating knowledge sharing across functions and hierarchical levels within an organization (Noe et al., 2010). Such knowledge sharing effectively enhances the capability of employees to access and absorb relevant knowledge distributed throughout varied segments of an organization, which should enhance organizational innovation (Di Milia & Birdi, 2010; Sung & Choi, 2012). In addition, organizational learning practices encourage employees to participate in the innovation process by inspiring them to recognize learning and knowledge generation as part of their work responsibilities as well as to improve the status quo rather than passively accept it (Shipton et al., 2005).

*Hypothesis 5:* Organizational learning practices mediate the relationship between training investment and innovative performance.

### *Innovative climate as a moderator*

Although we expect a positive association between various learning practices and organizational innovation in most circumstances, this association may be more pronounced in organizations with a strong climate for innovation. An innovative climate can be defined as employees' perceptions of the enduring features of the organization that accept and support new ideas and change as well as supply resources for innovative initiatives (West & Richter, 2008). Aside from their potential benefits, innovations 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. (Choi, 2007, p. 472)*

An innovative climate offers a safety net against such risks and tension with others, which can be effectively addressed by encouragement from the management and trusting relationships with other members (Patterson et al., 2005). Trusting

relationships and the accompanying psychological safety in particular are critical indicators of an innovative climate that allows employees to explore new approaches, express different ideas without the fear of being blamed, and mutually accept others' risky ideas (West & Richter, 2008). Thus, under a high level of innovative climate, employees understand that new ideas are routinely accepted and rewarded rather than rejected and punished (Bowen & Ostroff, 2004).

Given the role of an innovative climate in supporting organizational innovation, the relationship between learning practices and innovative performance may attenuate—and even disappear—when the climate is unfavorable toward achieving innovation. Under a low level of innovative climate, the motivation of employees for innovation is stifled. Various learning practices may strengthen existing routines that have already been developed and validated, which results in increased coordination and reliable operation within the status quo (Noe et al., 2010). Meanwhile, the value of various learning practices, especially with regard to innovative performance, is likely unleashed when employees collectively adhere to the organizational image in which innovative attempts are appreciated and even half-baked ideas do not prompt unfavorable reactions in their workplace.

*Hypothesis 6:* Innovative climate moderates the relationship between learning practices and innovative performance in such a way that the relationship is stronger in organizations with a higher level of innovative climate.

## Method

### *Sample and data collection procedure*

The hypotheses were tested by using the Human Capital Corporate Panel data archived by the Korea Research Institute for Vocational Education and Training (KRIVET). A stratified and random sample was drawn from private business organizations listed in the database of Korea Investors Service. KRIVET created a  $3 \times 4 \times 2$  matrix on the basis of the industry (i.e., manufacturing, banking, and service), organization size (i.e., 100–299, 300–999, 1000–1999, and more than 2000), and ownership type (publicly vs. privately owned). The initial sample of 1851 organizations was classified into each cell depending on the aforementioned organization characteristics. Approximately 25 percent of the organizations were randomly selected from each cell of the matrix to avoid the potential problems of over- or under-sampling of specific cells.

The corporate survey data were collected at two time points in 2004 (T1,  $N=454$ ) and 2006 (T2,  $N=464$ ). The senior executives or directors of strategy and directors of human resource management (HRM) of these companies were contacted to obtain information within their managerial sphere. Given that the present study aimed to examine the effects of training investment and learning practices on organizational innovative performance, we also matched the 2004 corporate survey data with patent registration data in 2006 and 2007. From the initial sample of 364 organizations, we excluded the organizations that reported the current set of learning practice items as inapplicable to them. This screening procedure was used to empirically test the hypotheses; these practices should be made available to employees so that the employees can utilize them in response to the training and development efforts of the organization. This screening procedure yielded a final sample of 260 companies that participated in both waves of data collection and provided sufficient data for the analysis.

Our final analysis sample of 260 companies represents three industry categories from 16 specific businesses: manufacturing ( $N=180$ , 10 industries, e.g., electronics, computer, chemical, machinery, and plastic), banking ( $N=16$ , one industry, banking/insurance), and non-banking service ( $N=64$ , 5 industries, e.g., telecommunication, software/system/online DB, and entertainment). The organization characteristics, including industry, size, and ownership type of the analysis sample, were not different from those of the initial sample.

The T1 sample was composed of HRM directors and strategy directors of each company as well as 7996 employees who represent various functions, such as engineering, purchasing, production, and marketing. On average, 30.75

[standard deviation ( $SD$ ) = 18.65] people per company participated in the survey, composed of 81.3 percent men with a mean age of 43.2 years ( $SD$  = 8.39) and an average tenure of 10.9 years ( $SD$  = 5.01). For the T2 data, 1558 department managers, with an average of 6.02 ( $SD$  = 2.35) managers per company, participated in the survey. The T2 manager sample was 96.1 percent men with an average age of 46.3 years ( $SD$  = 5.67) and an average tenure of 16.4 years ( $SD$  = 6.87).

## Measures

Data were collected from multiple sources. HRM directors rated the scales related to the investment in training and development, and learning practices of the company. Employees reported on the innovative climate. Strategy directors rated control variables related to the business environment of the organization. Department managers reported on the innovative performance. We also obtained the number of patents registered by each company, as archived by the Korean Intellectual Property Office (KIPO). All variables were rated on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

### Corporate training expenditure (HRM director, T1)

Unlike prior studies that relied on the subjective judgment of managers on the intensity of corporate training (e.g., Lau & Ngo, 2004), we employed the resource-based approach and assessed the actual amount of monetary investment in corporate training (Huerta et al., 2006; Sels, 2002). To this end, HRM directors reported the total cost of employee training on the basis of the financial data of the company. Corporate training expenditure included the direct costs of training, such as instructor fees, instructional materials, and lodging and meals during training but excluded salary for their own training department staff. The total amount of training-related expenses was divided by the size of the organization to obtain per capita spending on employee training.

### Financial support for education (HRM director, T1)

The extent to which the company provided financial support for external education was measured by the total amount of college or graduate school tuition reimbursed to the employees on the basis of financial data of the company (Jacobs et al., 2000). Similar to corporate training expenditure, the total amount reimbursed was divided by the organization size to compute per capita financial support for education.

### Learning practices (HRM director, T1)

Despite substantial research on organizational learning, researchers agree that operationally defining and measuring organizational learning in empirical research are excruciatingly difficult tasks (Arthur & Aiman-Smith, 2002; Di Milia & Birdi, 2010). For this reason, the development of the measures of learning as a multilevel phenomenon is generally lacking. Given the lack of existing measures, we thoroughly reviewed extant studies on organizational learning and identified 20 potential items that assess organizational learning. Then, we employed the Q-sort procedure, which offers a powerful quantitative tool for examining opinions and assessments. This procedure is widely used in various behavioral science fields (Brown, 1986). To this end, 10 experts, including five professors and five doctoral students from a Department of Organizational Behavior and Strategy, participated in Q-sort using those 20 items. On the basis of our theoretical account regarding the three types of learning practices suggested in this study, the experts classified the 20 items into three categories of learning practices. Of the 20 items, only 10 achieved unanimity from all members of the expert group (three items for individual learning, three items for interpersonal learning, and four items for organizational learning). The other 10 items that failed to achieve unanimity were excluded from the present analysis.

*Individual learning practices* were assessed by three items ( $\alpha$  = .68) drawn from prior studies (Birdi et al., 2007; Di Milia & Birdi, 2010), which included “Employees in our company actively engage in the following activities: (a) individual projects related to one’s task, (b) self-initiated learning, and (c) individual problem solving.” *Interpersonal learning practices* were assessed by using three items ( $\alpha$  = .64) grounded in prior studies (Bollinger & Smith,



2001; Gómez et al., 2004). The three items were “Employees in our company actively engage in the following activities: (a) mutual learning among employees, (b) mentoring/coaching each other, and (c) task rotation among employees.” *Organizational learning practices* were measured by four items ( $\alpha = .92$ ) on the basis of organizational learning practices described in existing studies (Di Milia & Birdi, 2010; Laursen & Foss, 2003): “Employees in our company actively participate in the following activities: (a) intranet-based knowledge sharing system, (b) quality circles, (c) suggestion program, and (d) Six Sigma.”

### **Innovative climate (employees, T1)**

Taking items used in prior studies (Choi, 2007; Patterson et al., 2005), innovative climate was assessed with three items ( $\alpha = .62$ ): (i) “Executives in our company tend to be authoritarian and do not accept others’ ideas” (reverse-coded), (ii) “In our company, all employees have opportunities to express their ideas and opinions,” and (iii) “In our company, employees have trusting working relationships.” Employee ratings of innovative climate were aggregated to the organization level because the unit of analysis for this study was the organization. This scale exhibited acceptable inter-rater agreement ( $r_{wg(3)} = .82$ ), which suggests that employees of the same organization possess shared perceptions of innovative climate. In addition, this scale produced acceptable intraclass correlations [ $ICC(1) = .09$ ,  $ICC(2) = .75$ ,  $F = 3.96$ ,  $p < .001$ ], which indicates substantial between-organization variation and organization-level reliability (Chen, Mathieu, & Bliese, 2004).

### **Innovative performance (department managers and KIPO, T2)**

Departing from prior studies that solely rely on either a subjective measure of innovative performance or an objective one, the present study assessed multiple dimensions of innovative performance such as NPDP, product and service differentiation, and patent registration. Department managers reported on the innovative performance of their respective companies by responding to the following two items ( $\alpha = .60$ ,  $ICC(1) = .27$ ,  $ICC(2) = .69$ ,  $F = 3.20$ ,  $p < .001$ ,  $r_{wg(2)} = .75$ ): “Our company has competitive advantage over other companies in (a) developing and introducing new products, and (b) introducing differentiation in the products and/or services offered” (1 = *not at all*, 5 = *a great deal*; Beugelsdijk, 2008; Lau & Ngo, 2004; Shipton et al., 2006). Department managers’ ratings on the two items were averaged to create a subjective measure of innovative performance. Considering the significance of patents that provide strong protection for proprietary knowledge for firms and its direct relatedness to inventiveness and technological novelty (Ahuja, 2000; Cohen, Goto, Nagata, Nelson, & Walsh, 2002), we also employed the number of patents registered by the company over a 2-year period following the T1 survey, as archived by KIPO, as an objective measure of innovative performance. To clearly establish the predictive relationship and causal directions, we set a 2-year time lag between predictors and innovative performance measures (Hagedoorn & Cloudt, 2003). Each company’s score for innovative performance was computed by averaging the subjective measure (NPDP, product and service differentiation) and objective measure (number of patents). Given the different metrics of these indicators of innovative performance, we transformed them into z-scores to obtain the mean of 0 and *SD* of 1 before averaging them. The subjective and objective measures were substantially correlated ( $r = .44$ ,  $p < .01$ ), supporting our aggregation of the two measures to form a single index of innovative performance.

### **Control variables (strategy director and HRM director, T1)**

Upon examining the literature, we identified a number of factors that may bear significance for organizational innovation. In our analysis, we controlled the effects of the following factors: (i) organization size, (ii) industry type, (iii) competitive environment, (iv) market change, (v) technology change, (vi) intensive selection, (vii) incentive compensation, and (viii) performance appraisal. Organization size is acknowledged as a critical firm-specific factor that affects innovative performance (Shipton et al., 2005). Firm size indicating the number of employees was log-transformed (Shipton et al., 2006). Organizations in the present sample were drawn from diverse industries that likely face different market and technological dynamics. To control the effects of industry type, we created two dummies for the following three industry categories: (i) manufacturing, (ii) banking, and (iii) non-banking service industries. Innovation literature also emphasizes the role of external factors in driving organizational efforts

to innovate. In this study, we included the extent of competition (Stelzer, 2002), market change (Langerak, Hultink, & Robben, 2007), and technology change (Benamati & Lederer, 2001) to control the effects of environment-specific factors. The extent of competition was measured by the item “How many domestic competitors do you have?” [1 (*none*), 2 (*1–2*), 3 (*3–4*), 4 (*5–9*), and 5 (*more than 10*)]. Market change was measured by the item “In our business, it is very hard to predict change in market and consumer demand” [1 (*strongly disagree*) to 5 (*strongly agree*)]. Technology change was assessed with the item “To what extent did your company experience technological changes in the last three years?” [1 (*not at all*) to 5 (*a great deal*)]. Strategy directors rated these scales.

In addition, we controlled the effects of other relevant HR practices by including the extent to which organizations deployed a system of intensive selection (Katou, 2009), performance appraisal (Shipton et al., 2006), and incentive compensation (Beugelsdijk, 2008). Intensive selection was measured by using 12 items and by asking HRM directors to mark which of the following procedures their company administers prior to hiring: (i) personality test, (ii) aptitude test, (iii) personality interview, (iv) oral competence test, (v) writing competence test, (vi) IQ test, (vii) group discussion, (viii) camp/outdoor observation, (ix) internship, (x) performance test, (xi) recommendation, and (xii) letter of self-introduction. Performance appraisal was measured by asking HRM directors to mark which of the following systems their company utilizes for employee performance appraisal: (i) balanced scorecard, (ii) management by objectives, (iii) competence appraisal, and (iv) leadership appraisal. Incentive compensation was assessed by simply asking HRM directors whether their company offers performance-based incentives [0 (*no*) and 1 (*yes*)].

## Results

Although the three learning practices and innovative climate were reported by different sources, the data were collected at the same time. A confirmatory factor analysis of the 13 items that comprise the three learning practices and innovative climate measures was conducted to test their empirical distinctiveness. The four-factor model exhibited good fit with the data [ $\chi^2(df=59) = 87.19, p = .01; CFI = 0.95; RMSEA = 0.043$ ] and performed better than any of the alternative three- and two-factor models (all  $p < .001$ ). The confirmatory factor analysis pattern supports the empirical distinctiveness of the three learning practices and innovative climate. Descriptive statistics and correlations among study variables are reported in Table 1.

To test the hypotheses, we employed structural path analysis. When the sample size is not enough compared with the number of parameters, reducing the number of indicators was recommended (Bandalos & Finney, 2001). Our model included 18 indicators of seven study variables in addition to nine control variables, thus resulting in 351 parameters that must be estimated [ $27(27 - 1)/2 = 351$ ]. With this level of complexity, we were forced to employ a structural path analysis. That is, we ran the model by using scale means of each construct in the model instead of incorporating item-level observed variables to create latent factors.

### *Hypothesized model and plausible alternative models*

We fit the hypothesized model that incorporated all paths suggested in Hypotheses 1–6 as depicted in Figure 1 along with the covariances between the two training investments and among the three learning practice variables. All three learning practice variables and innovative climate were mean-centered to reduce the problem of multicollinearity (Katrachis, 1993). The main effect of innovative climate on innovative performance was also included. This hypothesized model exhibited a good fit with the observed pattern [ $\chi^2(df=92) = 142.55, p = .001; CFI = 0.96; RMSEA = 0.046$ ; Akaike information criterion ( $AIC$ ) = 338.55; Hu & Bentler, 1999]. Following the common structural equations modeling (SEM) practice, we tested the possibility that theoretically plausible alternative models offer better explanations of the current data. First, although complete mediation by learning practices was

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	13	14	15	16
1. Organization size	5.84	1.18	—															
2. Manufacturing industry	0.69	0.46	.17**	—														
3. Service industry	0.25	0.43	-.25*	.85**	—													
4. Competitive environment	3.37	1.13	-.19*	.31**	.28**	—												
5. Market change	2.94	0.80	-.01	.05	-.08	.07	—											
6. Technology change	3.10	0.81	.25**	.24**	-.25**	-.18**	.15**	—										
7. Intensive selection	3.64	1.65	.45**	-.01	-.08	-.17**	.06	.14*	—									
8. Performance appraisal	1.43	1.32	.32**	-.07	.01	-.14*	.08	.17**	.35**	—								
9. Incentive compensation	0.91	0.18	.05	-.04	.05	-.01	.01	-.03	.06	.08	—							
10. Corporate training expenditure <sup>a</sup>	0.41	0.67	.45**	-.03	-.05	-.05	.01	.15*	.26**	.39**	.07	—						
11. Financial support for education <sup>a</sup>	0.08	0.07	.06	.04	-.01	-.01	-.02	-.01	-.01	-.06	.06	.35**	—					
12. Individual learning practices	3.24	1.05	.12	.11	-.14*	-.08	.09	.04	.20*	.08	-.01	.13*	-.05	—				
13. Interpersonal learning practices	3.22	1.04	.10	.15*	-.08	-.16**	.14*	.01	.17**	.19**	.01	.11	.01	.28**	—			
14. Organizational learning practices	3.26	.59	.15*	.14*	-.09	-.06	-.05	.23*	.08	.14*	.01	.20**	.09	.04	.12	—		
15. Innovative climate	3.24	.29	-.02	-.25**	.26**	-.01	.09	-.01	.15*	.20**	.06	.18**	.10	.08	.18**	.09	—	
16. Innovative performance	0.17	0.79	.33**	.11	-.11	.09	.19**	.14**	.21**	.23**	.07	.36**	.04	.11	.16**	.26**	.14*	—

Note. Unit of analysis is organization (N=260).

<sup>a</sup>Unit is one million Korean won.

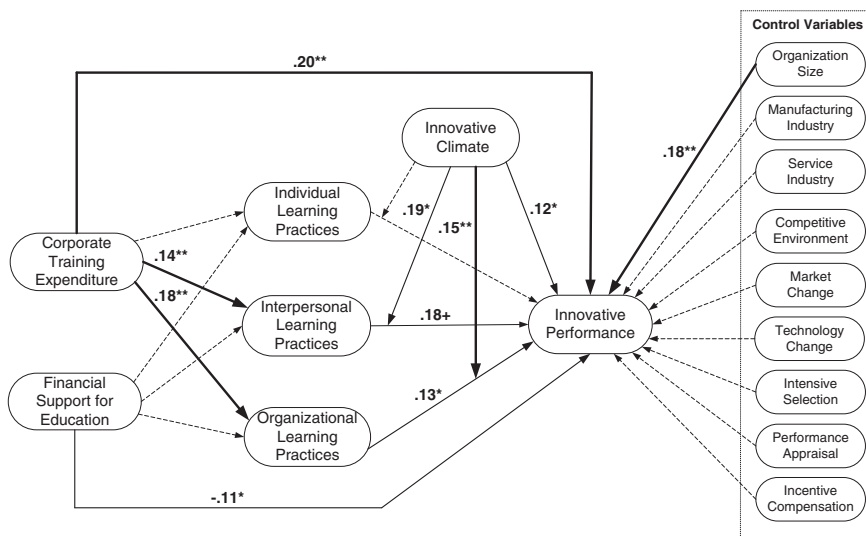
\*p < .05; \*\*p < .01.

hypothesized, learning practices may only partially mediate the relationship between training investment and innovative performance. This possibility was tested by adding two direct paths from training investment factors to innovative performance. This model produced a model fit [ $\chi^2(df=90)=134.18, p=.002; CFI=0.97; RMSEA=0.044; AIC=334.18$ ], which is significantly better compared with the hypothesized model [ $\Delta\chi^2(\Delta df=2)=8.37, p<.05$ ]. In the second alternative model, we tested the possibility that training investment and learning practices have parallel or independent effects on innovative performance instead of having a mediated relationship. This model produced a worse model fit compared with the hypothesized model [ $\chi^2(df=96)=153.44, p=.000; CFI=0.95; RMSEA=0.048; AIC=341.44$ ]. Hence, the partial mediation model that provided the best fitting, theoretically plausible explanation of the data was preferred.

*Hypothesis testing*

The SEM results of the partial mediation model are presented in Figure 2 with standardized path coefficients. Among the control variables, only firm size was a significant predictor of innovative performance ( $\beta = .18, p < .01$ ). After controlling their indirect effects through learning practices, both corporate training expenditure and financial support for education remained significant predictors of innovative performance. Corporate training expenditure showed a strong positive effect on innovative performance ( $\beta = .20, p < .01$ ). Surprisingly, the direct effect of financial support for education on innovative performance was negative ( $\beta = -.11, p < .05$ ).

The SEM results also showed that corporate training expenditure was a positive predictor of interpersonal and organizational learning practices ( $\beta = .14$  and  $.18$ , respectively, both  $p < .01$ ). Financial support for education was not a meaningful predictor of these learning practices. Of the three learning practices, interpersonal and organizational learning practices increased innovative performance significantly ( $\beta = .18, p < .10$ , and  $\beta = .13, p < .05$ , respectively). However, the effect of individual learning practices on innovative performance was nonsignificant, disconfirming Hypothesis 3.



Note. Thicker lines represent statistically more significant results. Nonsignificant paths are depicted as dotted lines in the diagram.  
 +  $p < .10$   
 \*  $p < .05$   
 \*\*  $p < .05$

Figure 2. Final structural model predicting organizational innovative performance

These patterns indicated that among the three types of learning, interpersonal and organizational learning practices mediated the effects of corporate training expenditure on innovative performance. Following recent recommendations (MacKinnon, Krull, & Lockwood, 2000), we validated our mediation hypothesis by employing the product-of-coefficient approach. We tested the statistical significance of the indirect effects of training investment on innovative performance by using the Sobel test. The Sobel test found that the indirect effects of corporate training expenditure through interpersonal and organizational learning practices were significant (both  $p < .05$ ). We tested these indirect effects through the bootstrapping procedure to validate them in a robust manner (Mackinnon, Fairchild, & Fritz 2007). The bootstrapping empirically supported the indirect effects of corporate training expenditure through interpersonal and organizational learning practices (point estimate=0.02,  $p < .05$ , confidence interval of 0.01 and 0.02; point estimate=0.01,  $p < .10$ , confidence interval of 0.00 and 0.01), which partially supports Hypotheses 4 and 5.

Finally, we examined the moderating role of innovative climate in the present model. In addition to its significant direct effect on innovative performance ( $\beta = .12, p < .05$ ), an innovative climate significantly moderated the effects of interpersonal and organizational learning practices on the outcome ( $\beta = .19, p < .05$  and  $\beta = .15, p < .01$ , respectively). To examine the specific forms of these significant interactions, we conducted simple slope analysis (Aiken & West, 1991). Both plots displayed in Figure 3 revealed that the positive effects of interpersonal and organizational learning practices on innovative performance were stronger when employees' collective perception of innovative climate was high ( $\beta = .51, p < .05$  and  $\beta = .72, p < .01$ , respectively) than when it was low ( $\beta = .30, ns$ , and  $\beta = .45, p < .10$ , respectively), thus supporting Hypothesis 6.

### Robustness of the empirical findings

To check the robustness of our findings, we performed two sets of post-hoc analysis. First, the current analysis sample of 260 organizations was formed by applying a relatively strict screening procedure in which we dropped a substantial portion of the sample because of the high number of missing responses to the learning practice items. Given the possibility that even though employees are willing to engage in various learning activities, if the organization does not offer such an opportunity from the beginning, assessing the extent to which they engage in such learning practices can be misleading. To ensure that organizations offered employees the opportunities to engage in learning

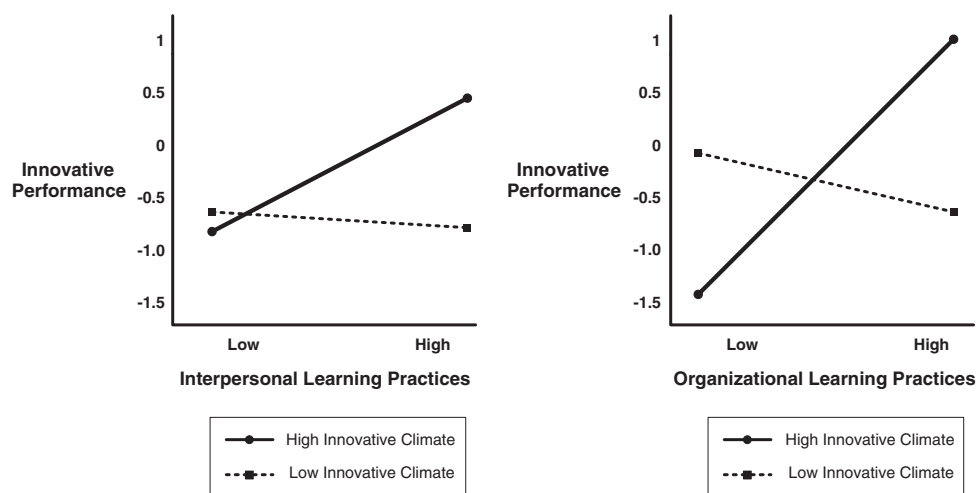


Figure 3. Interaction between innovative climate and learning practices in predicting organizational innovative performance

practices, we excluded the organizations that responded to the learning practice items as “not applicable to our organization” in more than a third of the cases (thus, four or more items out of 10 items were “not applicable”). As a result, our final analysis sample included 260 organizations that had provided employees with seven or more practices out of the 10 measured. If we had not applied this screening procedure, the analysis sample could have been much larger and composed of 364 organizations. When performing the same SEM with the two samples, results based on our final analysis sample and those based on the larger sample of 364 organizations were almost identical, except the direct effects of corporate training expenditure and financial support for education on innovative performance became somewhat stronger in the latter sample ( $\beta = .40$  and  $-.27$ , respectively, both  $p < .001$ ). All other hypothesis testing results were exactly the same across the two samples, which indicates the robustness of the current empirical patterns.

Second, the present research design introduced a potential source of systematic bias because a number of present study variables exhibited non-normal distribution. In accordance with previous works, observed variables in social sciences are almost never normally distributed (Shimizu & Kano, 2008). In addition, structural equation models with continuous variables do not have substantial problems with non-normality (Hancock & Nevitt, 1999). Nevertheless, we tested the hypotheses by employing bootstrapping to validate the current findings further. This procedure has gained increasing acceptance as an analytic tool to handle the non-normality problem (Ekström & Sjöstedt-de Luna, 2004; Hancock & Nevitt, 1999). Although the results became slightly less significant, the pattern of the results based on the bootstrapping procedure was almost identical to the current findings based on SEM, which further confirm the robustness of the results.

## Discussion

Departing from existing studies that are principally focused on operational outcomes, such as productivity and financial performance (Tharenou et al., 2007), the present study introduces theoretical propositions that explain the mechanism through which training and development investments affect organizational innovative performance. We further clarified the mediating process that involves multilevel learning practices that account for the training–innovation relationship, which is assumed but has yet to be examined. In addition to conceptual advancement, the current study provides the first empirical investigation on the effect of training and development investments on learning and innovation at the organizational level based on multi-source, time-lagged data. Later, we highlight the implications of the current findings, limitations, and directions for future research.

### *Implications of training and development investments for learning and innovation*

Consistent with prior studies (Collins & Smith, 2006; Huerta et al., 2006), the present study offers an empirical demonstration regarding the prevailing belief on the value of corporate training for innovation at the organizational level. This study also partially supports the often-presumed mediating role of learning in the relationship between corporate training and innovation (Laursen & Foss, 2003; Shipton et al., 2005, 2006). Surprisingly, in contrast to prevailing beliefs (Bassi & McMurrer, 1998), our analysis shows that financial support for education has a direct negative effect on innovation without any significant effect on learning processes that improve innovative performance. Given that the zero-order correlation between financial support for education and innovative performance is nonsignificant ( $r = -.01$ , *ns*), the significant direct negative effect of financial support for education might be due to the classic situation of statistical suppression (MacKinnon et al., 2000). These negative or neutral implications of financial support for education with regard to learning and innovation are inconsistent with previous findings. Existing research indicates that tuition reimbursement or other forms of financial aid for education is an attractive incentive for employees, which results in positive organizational attitudes (e.g., perceived organizational support, job

satisfaction, and commitment) and decreased turnover intention (Noe, Wilk, Mullen, & Wanek, 1997; Rhoades & Eisenberger, 2002).

The literature has somewhat neglected organization-wide implications of financial support for education, which may be because of the previous focus on individual-level outcomes. Considering that such support is offered only to a small fraction of employees, the positive outcomes reported by employees who experienced the benefits of organization-sponsored external education could engender perceptions of relative deprivation and unfairness among those excluded from these special benefits. In addition to the potential dependence on the level of analysis, employee participation in external education may distract them from their tasks at hand, which hampers the effective transfer of external knowledge (Benson et al., 2004; Jacobs et al., 2000). However, at the current juncture marked by limited empirical evidence, these interpretations are speculative, presenting a need for further systematic research.

### *Implications of learning practices for organizational innovation*

Our analysis shows that learning practices offer a meaningful intervening process between corporate training expenditure and organizational innovation. While individual learning practices are not significantly associated with innovation, interpersonal and organizational learning practices have significant and positive effects on the outcome. Individual insight or knowledge may not contribute to innovation unless shared and integrated within the organizational context (Gómez et al., 2004; Sung & Choi, 2012). The present findings provide empirical support for the argument in knowledge management literature, that is, the importance of knowledge lies in the connections among people instead of within a person (cf. situated knowledge web; Nidumolu, Subramani, & Aldrich, 2001). In generating organizationally meaningful innovations, collective processes based on communities of practice, distributed expertise, and processes that link individuals and groups/communities seem to play a more critical role compared with knowledge embedded in individual employees (Shipton et al., 2006; Sung & Choi, 2012).

Our analysis also indicates that even collective organizational learning processes may be ineffective in generating innovation when the organizational context does not support innovation. The present study further extends HR and innovation literature by demonstrating that learning practices promote innovation only when an organization cultivates a work climate that encourages innovation (Bowen & Ostroff, 2004). Thus, the co-presence of collective learning processes and innovative climate seems necessary in achieving innovative performance at the organizational level.

### *Practical implications*

The present findings offer several implications for practitioners. Our analysis demonstrates that financial investment in corporate training significantly increases organizational innovation over the succeeding 2 years. By contrast, employee development through external education exhibits a neutral or even negative effect on learning and innovative performance. Nevertheless, the professional development of employees plays a positive role in maintaining the long-term innovative potential of an organization and is also deemed necessary in retaining a high-profile workforce in several professional domains such as medicine, law, and engineering.

To maximize the value of financial support for education and minimize unintended negative performance implications, organizations should implement such programs with caution. First, highly unbalanced financial aid for education across employees may cause a sense of deprivation among the majority of employees excluded from such privilege, as described earlier. Thus, organizations should ensure fairness in selecting beneficiaries of such financial support. Moreover, organizations must utilize the support as an effective motivational tool for employees without causing resentment among those who were excluded. Second, studies based on human capital theory suggest that employees who participate in organization-sponsored education programs are more likely to leave their companies because of their increased marketability and credentials (Pattie, Benson, & Baruch, 2006). To retain these

employees, organizations should recognize the turnover risk and implement policies that require employees to stay for a certain period or repay the education cost (Benson et al., 2004). Finally, studies show that task relevance of the education program decreases the turnover intention of employees (Pattie et al., 2006). By providing highly task-relevant external education, organizations can increase congruence between newly acquired knowledge and task requirements at the individual level as well as further promote organization-wide knowledge transfer, which increases organizational capability and performance.

The current data also show that interpersonal and organizational learning practices significantly increase organizational innovative performance over a 2-year period. As shown in our analysis, organizations can promote these collective learning activities by offering more corporate training to their employees. Collective learning practices, such as making suggestions, using the knowledge management system, mentoring, and adopting Six Sigma activities, are often initiated and directed by supervisors. However, the active and committed participation of employees determines the effectiveness of such learning events even when they are forced to engage in collective learning processes (Noe et al., 2010). To this end, managers should cultivate an innovative climate and obtain employees' buy-in with regard to the implementation of various learning practices and programs (Choi, 2007).

### *Study limitations and future research directions*

The present results should be interpreted with caution, considering the several limitations of the study. First, our study employed multi-source research design by using data from multiple constituents (i.e., HRM directors, strategy directors, department managers, employees, and KIPO data). In addition, training investment was measured by actual monetary cost archived by the company. Nevertheless, all predictors were reported by the HRM director. To ensure the accuracy and validity of information, future studies should further utilize independent sources of data for training investment and learning practices.

Second, although the innovative performance data were collected over a 2-year period after the survey, certain efforts for developing employees and learning processes may take more than 2 years to make an impact on innovative performance. For instance, Birdi et al. (2008) reported that certain HR processes (e.g., teamwork) may take more than 6 years to affect organizational performance. Similarly, the effort exerted in building human capital through financial support for education and individual learning practices may bear fruit in the long run despite the short-term cost (Rhoades & Eisenberger, 2002).

Third, employing the resource-based view and input function of HR practices, we focused on the corporate monetary expenditure on training and development. To examine the validity of the current measure of training investment, we compared the current variable with two other training-related variables often used in extant studies, namely the number of training hours provided to employees and effectiveness of training as perceived by employees. Both variables were significantly correlated with our measure of corporate training expenditure ( $r = .15$ ,  $p < .05$ , and  $r = .27$ ,  $p < .01$ , respectively). We conducted the same SEM analysis by using both variables as alternative measures of training investment. Interestingly, of the two variables, the results based on perceived effectiveness of training were almost identical to the current results based on financial investment. Apparently, the efforts of an organization to provide high-quality HR practices in the form of financial investment (input side) are highly linked to employee positive perceptions toward training (output side). Nonetheless, given the potentially significant role of other characteristics of training efforts, such as specific contents or instructional design of training for employee learning and innovation (Noe et al., 2010), further research based on alternative measures of training should be conducted.

Fourth, although perceptual measures of learning practices and learning capabilities rated by HR managers and executives have been widely used (Gómez et al., 2004; Laursen & Foss, 2003), managerial assessment may overestimate the effects of training and development on performance. In this respect, having objective indicators of learning at various levels assessed over time would be ideal in measuring the actual amount of changes in response to training investment. For instance, organizational learning practices could be assessed by the change in



the number of ideas shared by employees through the intranet or frequency of their intranet access for updating and retrieving the organizational knowledge base. Future studies could employ objective indexes of learning or external expert ratings in measuring diverse learning practices in organizations.

Finally, data were collected from Korean organizations commonly characterized by distinct organizational culture and managerial practices (Quick & Kim, 2009). Often, the effects of HR practices on employee behavior are different in emerging market countries compared with those observed in Western organizations (Du & Choi, 2010). Contrary to our findings, which indicate that financial support for education negatively affects innovative performance, Bassi and McMurrer (1998) reported that tuition assistance programs contribute to organizational performance, such as market value, annual net sales, and gross profit, in 38 American trade firms. At this point, we cannot fully comprehend these different findings. However, we speculate that American employees gain more benefits from individualized personal development programs, whereas Korean employees gain more from collective corporate training. Further cross-cultural and cross-national empirical research is needed.

Despite these shortcomings, this study employed a rigorous empirical design and explained the training–innovation link that has only recently started to receive research attention. Further conceptual efforts may be directed to develop a matrix of relationships between different learning practices and distinct forms of innovations. For instance, learning practices that are beneficial for incremental innovations in work processes may differ from those considered beneficial for radical innovations in products and services. In addition, future theoretical and empirical endeavors are needed to achieve a comprehensive understanding of the intermediate processes between training and innovation beyond learning practices at three levels of analysis. For example, employee outcomes such as job satisfaction, employee commitment, organizational citizenship behavior, and turnover could be promising mechanisms that underlie the effects of training and development on organizational innovation, particularly at the individual level of analysis.

Although stating that people are the most important assets of an organization is axiomatic, most organizations typically react to crises by downsizing their personnel. Moreover, the first budget cut is typically targeted at training expenses (Mellahi & Wilkinson, 2008). However, the present results indicate that if an organization reduces its training expenditure (particularly for internal training) as a reaction to a crisis, its capability for innovation can be degraded in the coming years despite the increasing importance of persistent innovation to overcome the crisis and create turnarounds (Laursen & Mahnke, 2001). Therefore, the present study recapitulates the significance of investment on human capital for continuous organizational innovation, particularly when an organization encounters threatening situations. Such investments can ensure the long-term survival and growth of an organization.

## Acknowledgements

This work was supported by a grant from the National Research Foundation of Korea (NRF-2011-354-1-B00025) and by the Institute of Management Research at Seoul National University.

## Author biographies

**Sun Young Sung** is Assistant Professor of Management at Nanjing University, China. She earned her PhD in Strategy from Seoul National University, Korea. Her research interests include knowledge management in teams and organizations, organizational demography, and innovative performance at multiple levels of analysis.

**Jin Nam Choi** (jnchoi@snu.kr) is Professor of Management at Seoul National University, South Korea. He earned his PhD in Organizational Psychology from the University of Michigan. His research interests include innovation implementation, organizational creativity, and multilevel processes of human behavior in organizations.

## References

- Ahuja, G. (2000). Collaboration networks, structural holes, and innovation: A longitudinal study. *Administrative Science Quarterly*, 45, 425–455.
- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.
- Amabile, T. M. (1996). *Creativity in context*. Westview: Boulder Co.
- Aragón-Sánchez, A., Barba-Aragón, I., & Sanz-Valle, R. (2003). Effects of training on business results. *International Journal of Human Resource Management*, 14, 956–980.
- Arthur, J. B., & Aiman-Smith, L. (2002). Gain sharing and organizational learning: An analysis of employee suggestions over time. *Academy of Management Journal*, 44, 737–754.
- Bandalos, D. L., & Finney, S. J. (2001). Item parceling issues in structural equation modeling. In G. A. Marcoulides, & R. E. Schumacker (Eds.), *Advanced structural equation modeling: New developments and techniques*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Barrett, A., & O'Connell, P. J. (2001). Does training generally work? The returns to in-company training. *Industrial and Labor Relations Review*, 54, 647–662.
- Bassett-Jones, N. (2005). The paradox of diversity management: Creativity and innovation. *Creativity and Innovation Management*, 14, 169–175.
- Bassi, L. J., & McMurrer, D. P. (1998). Training investment can mean financial performance. *Training & Development*, 52, 40–42.
- Benamati, J., & Lederer, A. (2001). Rapid information technology change coping mechanisms and the emerging technologies group. *Journal of Management Information Systems*, 17, 183–202.
- Benson, G. S., Finegold, D., & Mohrman, S. A. (2004). You paid for the skills, now keep them: Tuition reimbursement and voluntary turnover. *Academy of Management Journal*, 47, 315–331.
- Beugelsdijk, S. (2008). Strategic human resource practices and product innovation. *Organization Studies*, 29, 821–847.
- Birdi, K., Clegg, C., Patterson, M., Robinson, A., Stride, C. B., & Wall, T. (2008). The impact of human resource and operational management practices on company productivity: A longitudinal study. *Personnel Psychology*, 61, 467–501.
- Birdi, K. S., Patterson, M. G., & Wood, S. J. (2007). Learning to perform? A comparison of learning practices and organizational performance in profit- and non-profit-making sectors in the UK. *International Journal of Training and Development*, 11, 265–281.
- Bollinger, A. S., & Smith, R. D. (2001). Managing organizational knowledge as a strategic asset. *Journal of Knowledge Management*, 5, 8–18.
- Bontis, N., Crossan, M., & Hulland, J. (2002). Managing an organizational learning system by aligning stocks and flows. *Journal of Management Studies*, 39, 437–469.
- Bowen, D. E., & Ostroff, C. (2004). Understanding HRM-firm performance linkages: The role of the strength of the HRM system. *Academy of Management Review*, 29, 203–221.
- Brown, S. R. (1986). Q technique and method: Principles and procedures. In W. E. Berry, & M. S. Lewis-Beck (Eds.), *New tools for social scientists*. Beverly Hills: Sage.
- Cantner, U., Kristin, J., & Schmidt, T. (2008). The use of knowledge management by innovators: Empirical evidence for Germany. Jena Economic Research Papers.
- Castellanos, R. M. M., & Martín, M. Y. S. (2011). Training as a source of competitive advantage: Performance impact and the role of firm strategy, the Spanish case. *International Journal of Human Resource Management*, 22, 574–594.
- Chen, C. J., & Huang, J. W. (2009). Strategic human resource practices and innovation performance: The mediating role of knowledge management capacity. *Journal of Business Research*, 62, 104–114.
- Chen, G., Mathieu, J. E., & Bliese, P. D. (2004). A framework for conducting multi-level construct validation. In F. J. Yammarino, & F. Dansereau (Eds.), *Multi-level issues in organizational behavior and processes* (pp. 273–303). Elsevier, UK: Emerald Group Publishing.
- Choi, J. N. (2007). Change-oriented organizational citizenship behavior: Effects of work environment characteristics and intervening psychological processes. *Journal of Organizational Behavior*, 28, 467–484.
- Cohen, W. M., Goto, A., Nagata, A., Nelson, R. R., & Walsh, J. P. (2002). R&D spillovers, patents, and the incentives to innovative in Japan and the United States. *Research Policy*, 31, 1349–1367.
- Collins, C. J., & Smith, K. (2006). Knowledge exchange and combination: The role of human resource practices in the performance of high-technology firms. *Academy of Management Journal*, 49, 544–560.
- Crossan, M., Lane, H., & White, R. (1999). An organizational learning framework: From intuition to institution. *Academy of Management Review*, 24, 522–537.
- Di Milia, L. D., & Birdi, K. (2010). The relationship between multiple levels of learning practices and objective and subjective organizational financial performance. *Journal of Organizational Behavior*, 31, 481–498.
- Du, J., & Choi, J. N. (2010). Pay for performance in emerging markets: Insights from China. *Journal of International Business Studies*, 41, 671–689.
- Ekström, M., & Sjöstedt-de Luna, S. (2004). Subsampling methods to estimate the variance of sample means based on nonstationary spatial data with varying expected values. *Journal of the American Statistical Association*, 99, 82–95.

- Glaveli, N., & Karassavidou, E. (2011). Exploring a possible route through which training affects organizational performance: The case of a Greek bank. *International Journal of Human Resource Management*, 22, 2892–2923.
- Gómez, P. J., Lorente, J. J. C., & Cabrera, R. V. (2004). Training practices and organisational learning capability. *Journal of European Industrial Training*, 28, 234–256.
- González-Romá, V., Fortes-Ferreira, L., & Peiró, J. M. (2009). Team climate, climate strength and team performance: A longitudinal study. *Journal of Occupational and Organizational Psychology*, 82, 511–536.
- Hagedoorn, J., & Cloudt, M. (2003). Measuring innovative performance: Is there an advantage in using multiple indicators? *Research Policy*, 32, 1365–1379.
- Hancock, G. R., & Nevitt, J. (1999). Bootstrapping and the identification of exogenous latent variables within structural equation models. *Structural Equation Modeling*, 6, 394–399.
- Hatch, N. W., & Dyer, J. (2004). Human capital and learning as a source of sustainable competitive advantage. *Strategic Management Journal*, 25, 1155–1178.
- Hu, L. T., & Bentler P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1–55.
- Huerta, M. E., Audet, X. L., & Peregort, O. P. (2006). In-company training in Catalonia: Organizational structure, funding, evaluation and economic impact. *International Journal of Training & Development*, 10, 140–163.
- Jacobs, R. L., & Washington, C. (2003). Employee development and organizational performance: A review of literature and directions for future research. *Human Resource Development International*, 6, 343–354.
- Jacobs, R., Skillings, M., & Yu, H. (2000). An evaluation of the workforce development programs jointly sponsored by the state of Ohio and Ohio civil service employees association. Final report, Columbus, OH: Workforce development and education graduate program, The Ohio State University.
- Kang, S. C., Morris, S. S., & Snell, S. A. (2007). Relational archetypes organizational learning, value creation: Extending the human resource architecture. *Academy of Management Review*, 32, 236–256.
- Katou, A. A. (2009). The impact of human resource development on organisational performance: Test of a causal model. *Journal of Behavioral & Applied Management*, 10, 335–356.
- Katrichis, J. (1993). The conceptual implications of data centering in interactive regression models. *Journal of the Market Research Society*, 35, 183–192.
- Langerak, F., Hultink, E., & Robben, H. (2007). The mediating role of new product development in the link between market orientation and organizational performance. *Journal of Strategic Marketing*, 15, 281–305.
- Lau, C. M., & Ngo, H. Y. (2004). The HR system organizational culture and product innovation. *International Business Review*, 13, 685–703.
- Laursen, K., & Foss, N. (2003). New human resource management practices complementarities and the impact on innovation performance. *Cambridge Journal of Economics*, 27, 243–263.
- Laursen, K., & Mahnke, V. (2001). Knowledge strategies, firm types and complementarity in human-resource practices. *Journal of Management and Governance*, 5, 1–27.
- López, S. P., Peón, J. M. M., & Ordás, C. J. V. (2006). Human resource management as a determining factor in organizational learning. *Management Learning*, 37, 215–239.
- MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual Review of Psychology*, 58, 593–614.
- MacKinnon, D. P., Krull, J. L., & Lockwood, C. M. (2000). Equivalence of the mediation, confounding and suppression effect. *Prevention Science*, 1, 173–181.
- Mellahi, K., & Wilkinson, A. (2008). A study of the association between downsizing and innovation determinants. *International Journal of Innovation Management*, 12, 677–698.
- Nguyen, T. N., Truong, Q., & Buyens, D. (2010). The relationship between training and firm performance: A literature review. *Research & Practice in Human Resource Management*, 18, 36–45.
- Nidumolu, S. R., Subramani, M., & Aldrich, A. (2001). Situated learning the situated knowledge web: Exploring the ground beneath knowledge management. *Journal of Management Information Systems*, 18, 115–150.
- Noe, R. A., Tews, M. J., & Dachner, A. M. (2010). Learner engagement: A new perspective for enhancing our understanding of learner motivation and workplace learning. *Academy of Management Annals*, 4, 279–315.
- Noe, R., Wilk, S., Mullen, E., & Wanek, J. (1997). Employee development: Issues in construct definition and investigation of antecedents. In J. Ford (Ed.), *Improving training effectiveness in work organizations* (pp. 153–189). Mahwah, NJ: Lawrence Erlbaum.
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. USA: Oxford University Press.
- Patterson, M. G., West, M. A., Shackleton, V. J., Dawson, J. F., Lawthom, R., Maitlis, S., & Robinson, D. L. (2005). Validating the organizational climate measure: Links to managerial practices, productivity and innovation. *Journal of Organizational Behavior*, 26, 379–408.
- Pattie, M., Benson, G. S., & Baruch, Y. (2006). Tuition reimbursement, perceived organizational support, and turnover intention among graduate business school students. *Human Resource Development Quarterly*, 17, 423–442.

- Popescu, L., Popescu, V., & Iancu, A. (2010). The economic impact of employer investment in training. *Economics, Management & Financial Markets*, 5, 170–175.
- Quick, B. L., & Kim, D. K. (2009). Examining reactance and reactance restoration with South Korean adolescents: A test of psychological reactance within a collectivist culture. *Communication Research*, 36, 765–782.
- Rhoades, L., & Eisenberger, R. (2002). Perceived organizational support: A review of the literature. *Journal of Applied Psychology*, 87, 698–714.
- Sels, L. (2002). More is not necessarily better: The relationship between the quantity and quality of training efforts. *International Journal of Human Resource Management*, 13, 1279–1298.
- Shalley, C., Zhou, J., & Oldham, G. (2004). The effects of personal and contextual characteristics on creativity: Where should we go from here? *Journal of Management*, 30, 933–958.
- Shimizu, S., & Kano, Y. (2008). Use of non-normality in structural equation modeling: Application to direction of causation. *Journal of Statistical Planning and Inference*, 138, 3483–3491.
- Shipton, H., Fay, D., West, M., Patterson, M., & Birdi, K. (2005). Managing people to promote innovation. *Creativity and Innovation Management*, 14, 118–128.
- Shipton, H., West, M., Dawson, J., Birdi, K., & Patterson, M. (2006). HRM as a predictor of innovation. *Human Resource Management Journal*, 16, 3–27.
- Stelzer, I. (2002). Innovation price competition and the tilt of competition policy. *Economic Affairs*, 22, 25–31.
- Subramony, M., Krause, N., Norton, J., & Burns, G. (2008). The relationship between human resource investments and organizational performance: A firm-level examination of equilibrium theory. *Journal of Applied Psychology*, 93, 778–788.
- Sung, S. Y., & Choi, J. N. (2012). Effects of team knowledge management on the creativity and financial performance of organizational teams. *Organizational Behavior and Human Decision Processes*, 118, 4–13.
- Tharenou, P., Saks, A. M., & Moore, C. (2007). A review and critique of research on training and organizational-level outcomes. *Human Resource Management Review*, 17, 251–273.
- West, M. A., & Richter, A. W. (2008). Climates and cultures for innovation and creativity at work. In J. Zhou, & E. C. E. Shalley (Eds.), *Handbook of organizational creativity* (pp. 211–236). New York: Lawrence Erlbaum Associates.