Managing Knowledge in Human Resource Practices and Innovation Performance

Huang, Jing-Wen; Chia Nan U. of Pharmacy & Science
Li, Yong-Hui; Kao Yuan U.

ABSTRACT
This study examines the mediating role of knowledge management in the relationship between human resource practices and innovation performance. Employing a sample of 146 firms in Taiwan, we propose that human resource practices facilitate knowledge management and such knowledge management mediates the relationship between human resource practices and innovation performance. Our results indicate that human resource practices are positively related to knowledge management. Knowledge management is, in turn, positively related to innovation performance. Further, our results provide evidence that knowledge management plays a mediating role between human resource practices and innovation performance.

Keywords:
Human resource practices, Knowledge management, Innovation performance
Managing Knowledge in Human Resource Practices and Innovation Performance

1. INTRODUCTION

In increasingly complex and rapidly changing environment, innovation is expected to become an increasingly critical component for firms to enhance potential value and maintain competitive advantage (Madhavan & Grover, 1998; Subramaniam & Youndt, 2005). Firms with greater innovative capacity will be more successful in responding to changing environments and developing new capacities that allow them to achieve higher performance (Montes, Moreno, & Fernandez, 2004). Innovation initiatives tend to depend heavily on employees’ knowledge, skills, and commitment as key components in the value creation process (Youndt, Snell, Dean, & Lepak, 1996). The knowledge-based view depicts firms as repositories of knowledge and competencies (Grant, 1996; Spender, 1996). According to this view, the knowledge and competencies of human resource are widely recognized as valuable assets for firms because of the characteristics of firm-specific, socially complex, and path-dependent (Collins & Clark, 2003; Wright, Dunford, & Snell, 2001; Youndt et al., 1996; Lado & Wilson, 1994). Human resource practices (HR practices) are the primary means by which firms can influence and shape the skills, attitudes, and behavior of individuals to do their work and achieve organizational goals (Collins & Clark, 2003; Martinsons, 1995). Previous literatures have paid more attention to the link of HR practices and firm performance and argued that HR practices can help firms attain organizationally relevant outcomes such as productivity, flexibility, and financial performance (Huselid, 1995; Delery & Doty, 1996; Becker & Gerhart, 1996; Guthrie, 2001; Collins & Clark, 2003). For innovation to take place, firms need to manage human capital that has the ability to turn knowledge into practical products and services. Firms can identify and exert a set of HR practices to elicit the willingness and motivation of employees to engage in developing innovation (Scarborough, 2003). Thus, HR practices play an essential role in facilitating the success of innovation. However, little empirical work has been done in examining the effect of HR practices on innovation (Jiménez-Jiménez & Sanz-Valle, 2005; Laursen & Foss, 2003; Michie & Sheehan, 1999), specifically how HR practices influence innovation performance. More attention has been paid to the relationship between HR practices and productivity and financial performance, but the understanding needs to be extended to encompass innovation performance (Laursen & Foss, 2003). In the present study, we seek to address the link of HR practices and firm’s innovation performance.

HR practices can be conducive to innovative activities because HR practices may allow firms to discover and utilize knowledge in the organization. Knowledge is possessed by human capital and cannot easily be transferred inside the firm (Hansen, 1999; Grant, 1996). Although a firm has access to the knowledge, skills and expertise of employees, it also needs knowledge management mechanisms in place to ensure effective utilization.
human capital. Knowledge management is an approach to adding or creating value by more actively leveraging the know-how and experience resided in individual minds (Ruggles, 1998; Scarbrough, 2003). Organizations that effectively manage and develop knowledge are better at translating their intellectual capital into innovative products and services (Sarin & McDermott, 2003; Scarbrough, 2003), and lead to favorable innovation results. As noted above, knowledge management may influence the relationship between HR practices and innovation performance. Therefore, in this study we attempted to examine whether HR practices will affect innovation performance through the intermediate variable of knowledge management.

Accordingly, the purpose of this paper is to examine the mediating effect of knowledge management between HR practices and innovation performance. The remainder of the paper proceeds as follows. The next section considers the relevant literature and sets out the hypotheses of this study. Following is the methodology for the study. Then, the paper presents the results of the empirical study in achieving the goals as those set out above. Discussion and conclusions are provided in the last section.

2. RESEARCH BACKGROUND AND HYPOTHESES

2.1 Human resource practices and knowledge management

Human capital, with their knowledge, expertise, and skills, is valuable resource of firms (Lado & Wilson, 1994; Delery & Doty, 1996; Wright et al., 2001; Collins & Clark, 2003). Organizations that effectively manage and leverage the knowledge and experience embedded in individual minds will create more value and achieve higher performance and competitive advantage (Ruggles, 1998; Scarbrough, 2003). It is important for firms to harness the involvement and participation of employees when they develop knowledge management activities. HR practices are the primary approaches used to elicit and reinforce employees’ skills, attitudes, and behaviors that a firm requires (Martinsons, 1995; Youndt et al., 1996; Collins & Clark, 2003). Some HR practices like staffing, trainings, participation, performance evaluation, and incentive compensation are related to enhanced commitment, lower turnover, and increased performance through their impact on employee development and motivation (Huselid, 1995; Becker & Gerhart, 1996; Guthrie, 2001). Firms can use a set of HR practices to provide employees with the skills, resources, and discretion they need to develop knowledge management. Thus, we argue that HR practices are key elements for a firm to increase its capacity in deploying and facilitating knowledge management activities.

Acquiring, developing, and utilizing employees with particular knowledge, skills, and abilities are crucial for firms to develop knowledge management activities. Selection and recruitment of individuals with appropriate skills and attitudes enable firms to integrate knowledge from diverse sources, and stimulate innovative idea generation (Martinsons, 1995; Scarbrough, 2003). When firms use staffing systems to attract and maintain
competent and qualified workforce, they can deal with creative thinking and problem solving to support knowledge management.

Continuous professional development is considered to be particularly important to knowledge workers. Firms need to offer internal and external training opportunities to develop and nurture required skills and capabilities of employees (Jaw & Liu, 2003; Brockbank, 1999; Nonaka & Takeuchi, 1995). Exposure to diverse education and training programs may foster employees to learn new knowledge and expertise, broaden their insight, and equip them with innovative minds and skills (Nonaka & Takeuchi, 1995). Such knowledge and skills learning from training programs are crucial for employees in the knowledge management process (Argote, McEvily, & Reagans, 2003; Von Krogh, 1998), and thus promoting proactive acquisition of knowledge, and the subsequent knowledge sharing and application.

Individuals having wider skills, expertise, and work responsibilities should give greater autonomy and self-regulation to do their work (Nonaka & Takeuchi, 1995). HR practices are able to attract employees to get involve in some kind of knowledge management and learning activities. Granting more discretion and participation in decision making can increase employees’ involvement, awareness and commitment (Damanpour, 1991; Glynn, 1996). If employees have more opportunity to provide inputs and determine what actions are required, they may bring new ideas and exchange knowledge continuously, and increase the diversity and richness of knowledge (Andrews & Kacmar, 2001; Grant, 1996), thereby facilitating the discovery and utilization of dispersed knowledge in the organization.

If firms want to elicit desired behaviors from employees, they must provide feedback and incentives that reinforce the desired behaviors (Collins & Clark, 2003). Performance appraisals and compensation are the primary HR practices firms use to reinforce employees’ behaviors and induce them to comply with organizational goals (Collins & Clark, 2003; Scarbrough, 2003). Firms can set up the objectives of performance appraisals that emphasize employees’ commitment to share and apply knowledge in their work and direct their knowledge management behaviors. Each member of the organization should be evaluated the effectiveness of their actions and realize how much they have achieved in knowledge management activities. The compensation structure should takes into account both extrinsic and intrinsic rewards (Scarbrough, 2003; Argote et al., 2003) and reward creativity, risk taking attitude, problem solving ability in order to promote knowledge diffusion and sharing (Argote et al., 2003; Von Krogh, 1998). Individuals may put more effort into knowledge management activities if compensation systems reward the contribution to knowledge and the acquisition and exchange of knowledge (Scarbrough, 2003; Collins & Clark, 2003; Von Krogh, 1998). Accordingly, compensation and performance appraisal systems encourage employees to communicate their knowledge base and contribution knowledge to organizations as widely as possible, and thus, are
fundamental to knowledge management within the firm.

According to the above, firms can use HR practices to motivate employees’ willingness and commitments to acquire, share, and apply knowledge within organizations when developing knowledge management. Thus, appropriate HR practices can support and promote the development of an organizational environment conducive to knowledge management work. We would expect that HR practices have positive impact on knowledge management. Hence, the following hypothesis is proposed.

**Hypothesis 1**: A set of human resource practices will be positively related to the level of knowledge management.

### 2.2 Knowledge management and innovation performance

Organizational innovation entailing the development of new products or services as well as new administrative systems is emerging as an important source of sustainable competitive advantage (Damanpour, 1991). The innovation process involves the acquisition, dissemination, and use of new and existing knowledge (Damanpour, 1991; Moorman & Miner, 1998). An organization’s innovative capability is closely tied to its ability to utilize its knowledge resources (Subramanian & Youndt, 2005). Knowledge management is an approach of more actively leveraging the knowledge and expertise to create value and enhance organizational effectiveness (Gold, Malhotra, & Segars, 2001; Ruggles, 1998; Scarbrough, 2003). A firm that exhibits a greater level of knowledge management activities experiences a learning effect in which it improve its capabilities in reducing redundancy, rapidly responding to change, and developing creative ideas and innovation (Scarbrough, 2003; Gold et al., 2001). Effective knowledge management facilitates knowledge communication and exchange required in the innovation process, and further enhances innovation performance through the development of new insights and capabilities (Madhavan & Grover, 1998; Nonaka & Takeuchi, 1995; Von Krogh, 1998). Therefore, knowledge management plays a pivotal role in supporting and fostering innovation. Since managing knowledge in the innovation process is complicated, this study focuses on those mechanisms that the organization uses to acquire, share, and apply new or improved knowledge.

Knowledge acquisition from outside the marketplace and inside the employees becomes opportunities for firms to recombine current knowledge and create new knowledge (Yli-Renko, Autio, & Sapienza, 2001). The newly acquired knowledge interacting with the previous knowledge can modify organizational knowledge stock (Nonaka & Takeuchi, 1995; Gold et al., 2001) and enhance the breadth and depth of knowledge available to the firm, thereby increasing the potential for new innovative combinations and leading to more product introductions, new management system, and technology improvement (Galunic and Rodan, 1998; Li & Calantone, 1998; Yli-Renko et al., 2001). The knowledge-based view suggests that knowledge acquisition activities will enhance a firm’s ability to efficiently perform its role (Grant, 1996). Thus, firms with good capability to acquire and absorb
external and internal knowledge would reduce uncertainty and achieve a greater number of administrative programs innovation and technological distinctiveness (Li & Calantone, 1998; Sarin & McDermott, 2003; Yli-Renko et al., 2001). The more knowledge acquisition activities are emphasized, the greater knowledge flows grow, and the more innovation outcomes can generate. Accordingly, we would expect a positive link between knowledge acquisition activities and innovation performance.

Knowledge sharing refers to collective beliefs or behavioral routines related to the spread of learning among different individuals or units within an organization (Moorman & Miner, 1998). Since knowledge is embedded in different individuals and different levels of the organization, it needs to be shared by organizational members in order to establish new routines and mental models (Galunic & Rodan, 1998; Nonaka & Takeuchi, 1995). Also, when knowledge is shared and exchanged, collective learning and synergistic benefits generated from the processes of exchanging knowledge and resource among members (Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998). Innovations come about when organizational members share their tacit knowledge and convert it into explicit knowledge in the form of a concept for a product or service (Von Krogh, 1998; Nonaka & Konno, 1998). Hence, firms that effectively share knowledge among members are likely to be more innovative.

Knowledge application is a focal element in knowledge management process (Grant, 1996). Based on the knowledge-based view, the value of individual and organization knowledge resides primarily in its application because of stickiness and tacitness of knowledge (Grant, 1996; Spender, 1996). New product development and innovation require the application and combination of specialized knowledge inputs from many different areas of technology (Yli-Renko et al., 2001). A deeper application of knowledge enables firms continuously to translate tacit knowledge into embodied products (Sarin & McDermott, 2003). By effectively applying knowledge, individuals might make fewer mistakes or improve their efficiency and reduce redundancy (Grant, 1996; Gold et al., 2001). Organizations might then ultimately be able to speed new product development and create more innovative production processing technologies, and administrative systems (Sarin & McDermott, 2003).

Accordingly, we would expect the level of acquisition, sharing and application of knowledge management provides a positive contribution to the firm’s innovation performance. Through effectively knowledge management, firms can foster innovative products and services, and achieve technical and administrative innovation. Hence, the following hypothesis is formulated.

**Hypothesis 2**: The level of knowledge management will be positively related to the innovation performance.

2.3 Mediating effects of knowledge management

As discussed above, Hypothesis 1 and 2 link HR practices with knowledge
management, and knowledge management with innovation performance. Implicitly, the discussion suggests that HR practices affect firms’ innovation performance through their effects on knowledge management. That is, a set of HR practices can be used to cultivate the level of acquisition, sharing, and application of knowledge management, which, in turn, promote employees’ propensity to innovate and enhance innovation performance. Thus, we argued that knowledge management plays a mediating role in the relationship between independent variables of HR practices and dependent variable of innovation performance. Accordingly, the following hypothesis is developed.

**Hypothesis 3:** Knowledge management will mediate the relationship between a set of human resource practices and the innovation performance.

### 3. RESEARCH METHODOLOGY

#### 3.1 Procedures and sample

We employed a questionnaire survey approach to collect data, and all independent and dependent variables required seven-point Likert-style responses ranging from “strongly disagree” to “strongly agree”. The target population for the study was the top 5000 Taiwanese firms listed in the China Credit Information Service Incorporation. Drawing from the dataset, we used the stratified random sampling method to select 150 firms in each of the five 1000 levels. Within each company, we collected the measures of background information, human resource practices, knowledge management, and innovation performance. Because all measures were collected from the same source, the Harman one-factor test was used to examine the potential problem of common method variance (Podsakoff & Organ, 1986). Significant common method variance would result in one general factor accounting for the majority of covariance in the variables. A principal factor analysis on the questionnaire measurement items yielded four factors with eigenvalues greater than one that accounted for 81.5 percent of the total variance, and the first factor accounted for 24.0 percent of the variance. Since a single factor did not emerge and one general factor did not account for most of the variance, common method bias is unlikely to be causing the relationships among variables in our study (Podsakoff & Organ, 1986).

A total of 750 surveys were distributed. Follow-up letters, emails, and phone calls were done two weeks later to appeal for participation. 157 surveys were returned; of the returned surveys, 146 were complete in all predictor and dependent variables, giving us a 19.47 percent usable response rate. We used a two-tailed t-test to compare the characteristics of respondent firms with those of the original population sample. Respondent firms did not significantly differ from nonrespondents in terms of firm age and firm size (both were p > 0.10). The lack of significant results indicated that response bias was not a significant problem in the current data.

#### 3.2 Measures

**Innovation performance.** In this study, innovation performance construct was measured by seven items indicating the extent to which firms were satisfied with the
achievements in their development and implementation of innovation activities. Following the distinction of previous researches (e.g., Damanpour, 1991; Ibarra, 1993), we adopted two dimensions of innovation performance including administration innovation and technical innovation. The administration innovation factor was assessed by a four-item scale aimed at measuring the extent of flexible responses to changes, quick adaptation, novelty of management programs, and new planning and control systems (α=0.919). Technical innovation was measured by asking the informants three questions about the extent to which the firm develops new elements or a new combination of already known elements in product improvement and innovation, technological level, and firm productivity (α=0.896).

**Human resource practices.** Human resource practices (HR practices) construct is a sixteen-item scale viewed as strategic personnel management emphasizing on effectively utilize human resources within the firm. Following previous researches (e.g., Delery & Doty, 1996; Youndt et al., 1996), we measured HR practices focused on five aspects of human resource management including staffing, training, participation, performance appraisal, and compensation. Staffing included three items regarding the selection for expertise and skill, employee recruitment, and concern for communication and motivation of employees (α=0.815). Training consisted of four items indicating the availability of formal training activities, comprehensive training policies and programs, training for new hires, and training for problem-solving ability (α=0.897). Three indicators measuring the participation practice reflected the degree to which employees were allowed to make decisions, have input into their work, and their voices were valued by the organization (α=0.762). Three items, including developmental focus, results-based appraisal, and behavior-based appraisal, were used to measure the performance appraisal practice (α=0.903). Compensation included three items that addressed the degree to which there were profit sharing, incentive pay, and the link between performance and reward (α=0.934).

**Knowledge management.** The knowledge management construct is based on eight items that asked respondents to indicate the extent of knowledge management within the firm. Drawing upon the core ideas of previous literatures (e.g. Gold et al., 2001; Grant, 1996), we measured knowledge management with three dimensions including acquisition, sharing, and application. The knowledge acquisition factor was reflected by three items, with respondents indicating the extent to which knowledge were obtained from customers and industry information, partnership, and employee opinions (α=0.908). The knowledge sharing factor was measured with a three-item scale tapping the degree to which the knowledge were openly shared between supervisors and subordinates, between colleagues, and between units (α=0.886). The two indicators in knowledge application factor are the effective management and utilization of knowledge into practical use (α=0.919).

**Control variables.** Firm size and age may influence performance because different size and age may exhibit different organizational characteristics, resource deployment, and
innovative capabilities. The same is true for firms in different industries. Therefore, these variables were included as controls to measure potential effects. Firm size was measured as the amount of annual sales in million NT dollars. Firm age was the number of years from the founding date. To determine the industry, two dummy variables were included to indicate whether a firm belonged to manufacturing industry (1 = yes, 0 = no) or high-tech industry (1 = yes, 0 = no).

4. ANALYSIS AND RESULTS

This study attempts to understand the relationships among HR practices, knowledge management, and the innovation performance. Table I displays the means, standard deviations, and correlations of all variables. Variance inflation factors (VIFs) were used to examine the effect of multicollinearity. The value of the VIFs associated with each of the predictors showed a range from 1.24 to 2.70, which fell within acceptable limits (Hair et al., 1998), suggesting no need for concern with respect to multicollinearity.

We test the hypotheses using regression analysis. Table II gives the results of relationships between HR practices and knowledge management. Model 1a-1c in Table II are the base models that include the control variables only. They indicate that this combination of variables does not have very significant effects on the dependent variable. As shown in model 2a-2c of Table II, HR practices are significantly related to all three measures of knowledge management at the p<0.001 level (R²=0.60, 0.61, and 0.58, respectively). Coefficients of staffing and participation are positive and significant for knowledge acquisition, sharing, and application (p<0.001). Similarly, training has positive and significant effects on acquisition (p<0.05), and application (p<0.001). Coefficients of compensation are positive and significant for knowledge sharing (p<0.001), and application (p<0.05). These findings indicate that firms would achieve a higher level of knowledge management if they seek to attract and select “premium workers”, invest more in education and training programs, give employees more opportunities of participation, and align compensation system to encourage employees to contribute their knowledge and skills. Accordingly, Hypothesis 1, which states that a set of HR practices is positively related to knowledge management, is supported.

Next, we examined how knowledge management affects the innovation performance. As depicted in model 5a and 5b of table III, knowledge management is significantly related to either measure of innovation performance at the p<0.001 level (R²=0.58 and 0.43). The positive and significant coefficients of knowledge acquisition (p<0.001), sharing (p<0.001) and application (p<0.01) suggest that firms would get a better administrative and technical innovation when knowledge is acquired, shared and applied well. In summary, three factors of knowledge management have the expected signs and also have significant effects on innovation performance. Accordingly, Hypothesis 2 is supported.

Analyzing the mediating effects of knowledge management involves the sequential
procedure (Baron & Kenny, 1986). The first step is to establish that the independent variable, HR practices, influences the mediator, knowledge management. This step was supported in model 2a to 2c of Table II above. In the second step, the dependent variable, innovation performance was regressed on HR practices. This step was supported in Model 4a and 4b of Table III. Lastly, the mediator, knowledge management, was included in the models to examine whether it reduces the effects of the antecedents to non-significance. As shown in model 6a and 6b of Table III, the coefficients for knowledge management were positive and significant, indicating a main effect of knowledge management on innovation performance. Further, with knowledge management in the equation, the effects of HR practices factors are significantly reduced, most of them to non-significance. The findings indicate that the inclusion of the knowledge management variable attenuates the relationships between HR practices and innovation performance. Thus, knowledge management plays a mediating role between HR practices and innovation performance, supporting the mediation effect proposed in Hypothesis 3 (Baron & Kenny, 1986).

5. DISCUSSION AND CONCLUSIONS

We develop a conceptual model for examining the role of knowledge management in HR practices and innovation performance. Our results indicate that HR practices are positively related to knowledge management, which in turn is positively related to innovation performance. The present evidence implies HR practices leads to increased knowledge management and the indirect path through knowledge management resulted in a higher level of innovation performance. Thus, the findings show support for the mediating role of knowledge management in the relationship between HR practices and innovation performance.

The major findings of this study have some implications. First, although the importance of human resource management in the innovation process has been recognized, the empirical studies are least attended (Jiménez-Jiménez & Sanz-Valle, 2005; Laursen & Foss, 2003). Our study contributes to the literature by filling the gap of the relationship between HR practices and innovation performance. The consideration of a set of HR practices makes a related understanding of the resource-based perspective and the value of firm’s human capital. Second, The results have revealed that the use of HR practices including staffing, employee participation, performance appraisal systems, and incentive-based compensation positively explain the firm’s innovation performance; however, if we add knowledge management as a mediating role, the directly positive relationship will attenuate. Thus, we demonstrate knowledge management is a mediating mechanism through which HR practices benefit innovation performance. It provides empirical support of the knowledge-based theory of value creation as an explanation of competitive advantage, and strengthens that knowledge management plays a strategic role within firms (Nonaka & Takeuchi, 1995; Grant, 1996; Spender, 1996; Sarin & McDermott, 2003).
The emergent model indicates that HR practices promote the acquisition, sharing, and application of valuable knowledge and pave the way for enhancement of administrative and technical innovation. These findings highlight the critical roles of human resource management and knowledge management in the process of innovation. The practical implication of our results is that managers may be able to actively manage their firm’s human capital through variety of HR practices to stimulate knowledge acquisition, sharing and application, and build competitive advantage. Furthermore, intense knowledge management activities in organizations can form the basis for creative and innovative thoughts that may eventually lead to even greater innovation performance. More importantly, our results suggest the mediation effect of knowledge management. To facilitate the link of HR practices and favorable innovation performance, managers need to be aware of the importance of knowledge management, devote the necessary effort to conduct effective knowledge management by encouraging employees to commit to acquire, share, and apply knowledge and experiences.

This study has several limitations. The first limitation is the use of a cross-sectional research design. Future research might address this issue by using longitudinal design in drawing causal inferences. Second, this study is limited because it included a relatively small set of HR practices currently used by organizations. Although the HR practices included in this research are generally thought to be strategic and were derived from existing theory, other HR practices may have important relationships with knowledge management and innovation performance. Third, the study is based on self-report data which may have the possibility of common method variance. However, our tests of common method variance do not find it to be a significant problem in this study. Future research will benefit from using objective measures for innovation performance that can be independently verified.

To conclude, human resource and knowledge are treasure assets for firms to utilize for constant innovation and sustainable competitive advantages. The viewpoints proposed in this study highlight the crucial importance of the mediating role of knowledge management when examining the relationship between HR practices and innovation performance.
REFERENCES


