



**Andrés A. Osorio-Londoño**

<https://orcid.org/0000-0002-5571-2684>

Department of Administration  
Faculty of Administration  
Universidad Nacional de Colombia,  
Sede Manizales, Colombia  
aaosoriolo@unal.edu.co

**Pablo F. Marín-Cardona**

<https://orcid.org/0000-0001-5194-8668>

Department of Administration  
Faculty of Administration  
Universidad Nacional de Colombia,  
Sede Manizales, Colombia  
pfmarin@unal.edu.co

**Debihd Luz Alcívar Chávez**

<https://orcid.org/0009-0005-7142-8316>

Doctoral Studies in Psychology  
Universidad Internacional Iberoamericana  
Campeche, México  
debihdl@yahoo.es

## Opportunity-enhancing human resource practices and radical innovation: The mediating role of exploration

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### Abstract

**Aim/purpose** – This study evaluates the influence of opportunity-enhancing human resource practices on radical innovation and examines the mediating role of exploration capability in this relationship.

**Design/methodology/approach** – Hypotheses were formulated to determine the relationship between opportunity-enhancing human resource practices and radical innovation, as well as the mediating role that exploration capability plays in this relationship. These were tested in 168 Colombian companies from the telecommunications and chemical-pharmaceutical sectors using Structural Equation Modeling (SEM) via the Partial Least Squares (PLS) technique.

**Findings** – The study indicates that opportunity-enhancing human resource practices positively and significantly influence radical innovation. In addition, this relationship is mediated by exploration capability.

**Research implications/limitations** – Organizations should implement opportunity-enhancing human resource practices to support radical innovation development. These practices provide employees with opportunities to explore relevant knowledge and technologies necessary for radical innovation.

**Originality/value/contribution** – Identifying and testing a specific group of human resource practices that facilitate radical innovation is one of the most significant gaps in the scientific literature on the relationship between human resource practices and innovation. According to this article, opportunity-enhancing human resource practices facilitate radical innovation in organizations. Furthermore, previous research has not examined the relationship between opportunity-enhancing human resource practices, exploration capability, and radical innovation.

**Keywords:** exploration capability, radical innovation, opportunity-enhancing HR practices, Structural Equation Modeling (SEM).

**JEL Classification:** O3, M1.

## 1. Introduction

Innovation is a relevant strategic purpose pursued by organizations. Companies renew and create value propositions through innovation, improving market performance (Than et al., 2023). In addition, innovation is necessary for adapting organizations to highly competitive business environments characterized by constant change and uncertainty (Mikalef et al., 2019). As a result, it is considered the most effective method of meeting market demands (Jin & Shin, 2020). Today, organizations must succeed at innovation to remain competitive (Rambe & Khaola, 2022).

Radical innovations can be considered an organization's boldest move (Le & Son, 2024; Stringer, 2000). Their development has the potential to change or create new markets, as they comprise novel value propositions that attract new buyers rapidly and in abundance (Colarelli O'Connor & McDermott, 2004). Thus, radical innovations are crucial for an organization's economic sustainability, as they produce market differentiation, positively impacting financial performance (Tiberius et al., 2021). However, radical innovations require companies to take risks and face market uncertainty, so they must acquire cutting-edge market knowledge intelligently (Colarelli O'Connor & McDermott, 2004). According to this, prior to radical innovations, firms should be able to identify and absorb external knowledge (Lennerts et al., 2020). This endeavor is called exploration, an organizational capability implemented to seize and apply new knowledge (Arekrans et al., 2023; Greve, 2007).

To produce innovations, organizations should purposely manage their employees (Choi et al., 2013). Radical innovations are boosted by employees exploring unknown and new trends in the market, which leads to new business opportunities (Ritala et al., 2018). Therefore, radical innovations are facilitated by a context that promotes knowledge exploration and idea generation (Colarelli O'Connor & McDermott, 2004).

Hence, human resource (HR) practices play an important role in promoting radical innovations (Green & Cluley, 2014). Specifically, opportunity-enhancing HR practices foster employees' participation in creative business idea development and implementation for radical innovations (Choi et al., 2013). Organizations use these practices to encourage employees to generate and share ideas for innovative projects (Haesli & Boxall, 2005). They allow employees to change the course of the organization through their motivation, knowledge, and skills (Lepak et al., 2006). Instead of limiting employees' actions, opportunity-enhancing HR practices encourage innovative thinking and discovery (Chowhan, 2016). Consequently, these practices enable firms to explore new knowledge, which, in turn, leads to radical innovations (Kuratko et al., 2014).

Despite this, research on the relationship between HR practices and radical innovation is still scarce in the scientific literature (Le & Son, 2024; Thneibat et al., 2022). Few works have examined how HR practices, directly or indirectly, through exploration capability, influence radical innovation outcomes and capabilities (Beddow, 2021; Cao et al., 2021). Most research focuses on HR practices and other types of innovation, such as product, process, open and green innovation (Engelsberger et al., 2022; Ferrarini & Curzi, 2022; Munawar et al., 2022; Salimi & Della-Torre, 2022; Than et al., 2023). The few studies on the relationship between HR practices and radical innovation approach the former from a traditional perspective that does not include opportunity-enhancing HR practices, which, based on their results, do not support said type of innovation (Barba-Aragón & Jiménez-Jiménez, 2020; Thneibat & Sweis, 2023). This suggests that not all HR practices support radical innovation (Curado et al., 2022; De Saá-Pérez & Díaz-Díaz, 2010).

This article responds to one of the most significant gaps in the scientific literature on the relationship between HR practices and innovation: this has to do with identifying and testing specific HR practices that facilitate and create firms' mechanisms to achieve radical innovation results and capabilities (Le & Son, 2024; Seeck & Diehl, 2017). Accordingly, it addresses the relationship between opportunity-enhancing HR practices and specific innovation outcomes, which has received scant attention in previous research (Chowhan, 2016). Furthermore,

the study fills a theoretical gap regarding how HR practices, exploration capability, and radical innovation are related, which has been highlighted in previous literature (Le & Le, 2023; Than et al., 2023). Thus, this article posits a theoretical model explaining how these variables are linked.

As a result, this study presents two objectives: first, it evaluates the influence of opportunity-enhancing HR practices on radical innovation; and second, it examines the mediating role of exploration capability on said relationship, given that this is a key antecedent for achieving radical innovation that is enabled by opportunity-enhancing HR practices (Choi et al., 2013). Therefore, this article answered two main research questions: How do opportunity-enhancing HR practices influence radical innovation? Moreover, how does exploration capability mediate the relationship between opportunity-enhancing HR practices and radical innovation? The remainder of this article is structured as follows: Section two presents the theoretical background that led to the research hypotheses; Section three presents the research methodology; Section four describes the results; Section five discusses the results; and, finally, Section six outlines the conclusions of the study.

## 2. Theoretical background

### 2.1. The Resource-Based View of the firm: Linking HR practices, exploration capability, and radical innovation

As described in HR management literature, HR practices facilitate the deployment of strategic capabilities through the competencies of employees (Lepak et al., 2006). These practices are firm resources that enable the implementation of business strategies that improve organizational performance (Jiang et al., 2012). According to Resource-Based View's (RBV) principles, firm resources create competitive advantages when they increase performance outcomes; they enable firms to differentiate themselves from their competitors; they cannot be perfectly imitated; and they are applied and aligned with their competitive strategies (Barney, 1991). Given this, the relationship between opportunity-enhancing HR practices, exploration capability, and radical innovation can be approached from RBV's principles.

The process of innovation is a collective effort triggered by employees' willingness to propose novel solutions to consumer expectations – *technological pull* (Liu & Atuahene-Gima, 2018), or to realize technological opportunities that facilitate the development of new products and services – *technological push*

(Hötte, 2023). As employees are the ones who bring creativity and innovation to organizations, they should be allowed to do so in a natural way (Maj, 2023). Thus, opportunity-enhancing HR practices support innovation at the organizational level by promoting innovative and free thinking in employees (Chowhan, 2016). These HR practices enable the process of learning and identifying new market knowledge and technological tendencies, facilitating the deployment of exploration as a capability (Keskin, 2006). Exploration capability is then responsible for the emergence of radical innovations because of the discovery process (Jurado-Salgado et al., 2024). In RBV's terms, opportunity-enhancing HR practices are resources that help companies develop a critical strategic capability, in this case, exploration, that allows them to implement a competitive strategy rooted in radical innovations that can significantly improve their market and financial performance.

## **2.2. Opportunity-enhancing HR practices**

HR practices are actions implemented by organizations to improve employees' performance that support organizational strategic outcomes (Lepak et al., 2006). Opportunity-enhancing HR practices enable employees to use their competencies and motivation discretionarily (Jiang et al., 2012). By implementing these practices, individuals will be able to contribute more toward the organizations' results (Lepak et al., 2006). In addition, employees are more likely to use ideas, creativity, intuition, and initiative in an organization with HR practices like these (Kuratko et al., 2014). Practices such as flexible job design, employee involvement, knowledge sharing, and work teams offer employees opportunities to contribute (Lepak et al., 2006).

First, flexible job design involves planning work that is less structured, restricted, and fixed and more adaptable, free, and open (Dorenbosch et al., 2005). This is so employees can act proactively in ambiguous and changing business situations (Erez, 2010). Through flexible job design, organizations encourage individuals to seek superior results and better challenges in their work (Kauffeld et al., 2004). A flexible job also gives workers the freedom to apply their competencies to organizational projects they find highly interesting (Dorenbosch et al., 2005).

Second, employee involvement is an HR practice that encompasses allowing employees to actively participate in decision-making processes in organizations (Rangus & Slavec, 2017). Firms should allow employees freedom, opportunities, and flexibility to influence their own outcomes and those of the firm at various lev-

els (McShane & Von Glinow, 2003). Employees develop responsibility, commitment, and creativity, which benefits company results (Rangus & Slavec, 2017).

Third, knowledge sharing is the willingness of an individual to provide information to others who are interested in it (Jarvenpaa & Staples, 2001). From a practical perspective, knowledge sharing occurs when an employee shares and acquires knowledge from others (Naim & Lenkla, 2016). However, at an organizational level, its scope is amplified because knowledge sharing involves capturing, organizing, reusing, and transferring the company's experience-based knowledge and then making it available to employees (Jarvenpaa & Staples, 2001). Knowledge sharing helps organizations solve problems, challenges, and opportunities more effectively and efficiently thanks to the integration and combination of knowledge from diverse individuals (Colarelli O'Connor & McDermott, 2004).

Finally, work teams are groups of individuals with specific roles and competencies that focus on achieving a common organizational goal through working interdependently (Colarelli O'Connor & McDermott, 2004). Work teams are considered a more effective strategy to perform complex tasks and undertake innovation projects (Hackman, 1987). Thus, it provides motivation, interest, curiosity, and competence to achieve organizational goals, especially under uncertain conditions (Kozlowski & Chao, 2012). By implementing work teams, organizations can adapt to changing business environments and cope with uncertainty (Kozlowski & Ilgen, 2006).

### **2.3. Exploration capability**

Companies generate processes, products, and services that are unique in the market through exploration capability (O'Reilly & Tushman, 2004). This capability consists of searching for original knowledge, using cutting-edge technologies, and creating products/services that do not have a specific demand antecedent (Greve, 2007). This capability implies that the organization separates itself entirely from its previous knowledge base (Dowell & Swaminathan, 2006). Because of this, exploration capability comprises unique events that do not become part of traditional business routines (Greve, 2007).

Therefore, exploration is considered an effective capability to generate innovations, particularly those that are more uncertain and based on skills that an organization lacks (Johnson et al., 2022; Taghizadeh et al., 2020). According to Braun et al. (2023), exploration capability involves searching, experimenting, and using acquired knowledge and information to establish additional markets

for the business. This means that exploration capability is an ambitious organizational endeavor, given that using acquired knowledge must generate unique products and technologies, which implies an organizational risk-taking approach (Arekrans et al., 2023). Consequently, exploration capability provides a first-mover advantage to companies in the market, resulting from aggressive behavior to gain an edge over competitors (Chavez & Chen, 2022; Rengkung, 2022).

In a strategic sense, exploration capability is implemented to create long-term competitive advantages for a company by integrating and coordinating new capabilities and knowledge (Ferreira et al., 2021). Not all companies are willing to explore because it is challenging to stay away from their technological proximity or business comfort zone (Mehralian et al., 2023). When it comes to stepping out of this zone, it means that top management must be proactive and see business as constantly evolving and adapting (Wang & Dass, 2017). Companies that explore see themselves as entities that change according to market dynamics or as entities that create such change by combining and using new knowledge strategically (Vedel & Kokshagina, 2021).

It is significant to note that creating original knowledge requires that a company's employees work in a way that allows them to freely share ideas and information (Rampa & Agogué, 2021). Due to this, exploration as a capability has been found in organizations where employees and other stakeholders can exchange knowledge and combine it in a way that becomes original and novel for the firm (Visscher et al., 2020). In other words, exploration cannot be assumed without opportunities for employees to contribute to the company's innovation results (Mehralian et al., 2023).

This indicates that exploration capability development highly depends on management practices that foster employee flexibility (Keskin, 2006). Thus, exploration capability is primarily embedded in organizations' HR practices rather than their routines and operations, which suggests that said practices play a role in exploration development (Colarelli O'Connor & McDermott, 2004). According to the literature, HR practices facilitate learning processes that enable exploration capability to be deployed (Barba-Aragón & Jiménez-Jiménez, 2020). A company will be able to develop active exploration as a capability only if its employees develop routines related to active exploration as an individual and team endeavor (Mikalef et al., 2021).

## 2.4. Radical innovation

The concept of radical innovation concerns the creation of novel value propositions or products in market segments not normally exploited (Stringer, 2000). Hence, organizations need to set aside their traditional product portfolio to implement flexible, research-based approaches to develop cutting-edge products and services (Colarelli O'Connor & McDermott, 2004). Indeed, radical innovation requires dramatic changes in their production capabilities, distribution systems, and how they relate to the customer (Stringer, 2000).

Radical innovation transforms and creates markets by creating novel lines of business (Lennerts et al., 2020). As radical innovation is a firm's strategic result without a market success precedent, this type of innovation is linked to high-risk organizational commercial projects, products, or services, which may highly impact the marketplace and create big returns for the firm (Colarelli O'Connor & McDermott, 2004). Radical innovation is a highly disruptive or discontinuous result reflected in revolutionary enterprise paradigms that can generate better organizational performance while transforming firm competition (Christensen, 1997).

Hu and Hughes (2020) warn that organizations face strategic risks in a long-term perspective when they are not able to achieve radical innovations. These authors argue that companies must develop radical innovations to renew their value propositions. According to Hu and Hughes, firms' lack of radical innovations can limit their market permanence. Nevertheless, achieving radical innovations requires company management to make decisions that leave rigid routines behind (Rampa & Agogué, 2021). To develop radical innovations, companies should establish HR policies and practices that enable employees to expand their competencies and freedom of action (Thneibat & Sweis, 2023). Obtaining radical innovations is difficult when individuals in organizations are not willing to challenge and modify the *status quo* that has contributed to the firms' past successes (Colarelli O'Connor & McDermott, 2004).

## 2.5. Investigative hypothesis

### 2.5.1. Opportunity-enhancing HR practices and radical innovation

Employees' roles do not remain continuous during radical innovation (Colarelli O'Connor & McDermott, 2004). As part of this type of innovation, employees undergo severe changes and are involved in various organizational



projects (Stringer, 2000). An unstructured work environment encourages radical innovation because employees can act deliberately, intuitively, and quickly to respond to uncertainty (Eisenhardt & Martin, 2000). When it comes to radical innovation, individuals tend to participate voluntarily and select projects they are passionate about. This indicates that these types of innovation do not require formal work structures or assignments (Colarelli O'Connor & McDermott, 2004). Job flexibility enables people prone to taking risks and changing the status quo to contribute meaningfully and intentionally to radical innovation (Amabile, 1998).

Empirically, employee involvement influences radical innovations (Shahriari et al., 2018). Identifying technological trajectory changes requires the participation of diverse individuals who combine their knowledge and experience to create novel knowledge paths (Van de Vrande et al., 2009). For example, I+D leaders identify new knowledge trajectories by engaging employees in idea generation processes. Since radical innovation involves discovering originality, identifying commercial applications, developing advanced manufacturing processes, and developing new business models, employees from diverse organizational functions must be involved in its implementation (Colarelli O'Connor & McDermott, 2004).

Additionally, work teams are more likely to generate innovations (Stringer, 2000). Empirically, radical innovation is influenced by the high capacity for generating ideas and solutions within work teams (Miron-Spektor et al., 2011). Likewise, it has been found that the diversity of these teams and the risk-taking behaviors encouraged among their members are associated with radical innovation (Cabrales et al., 2008). By combining knowledge, experience, and curiosity, teams are more likely to identify and commercialize radical ideas (Stringer, 2000). Additionally, teams are crucial to successful radical innovation projects because their members maintain focus on the activities, responsibilities, and roles (Colarelli O'Connor & McDermott, 2004).

Radical innovations result from sharing knowledge (Stringer, 2000), which departs from current technologies, processes, and practices (Abernathy & Clark, 1985). Radical innovations are based on the exchange of knowledge, particularly among individuals, that is, on the exchange of tacit knowledge (Colarelli O'Connor & McDermott, 2004). As a result, information and knowledge sharing can be considered an antecedent of radical innovation (Abernathy & Clark, 1985). Sharing ideas across departments and functions generates the most creative and radical ideas (Ritala et al., 2018). Through knowledge sharing, organizations produce unusual and unexpected patterns that lead to radical innovations

(Zahra & George, 2002). Empirically, evidence shows that knowledge sharing within organizations enhances radical innovations (Zhou & Li, 2012). Accordingly, the following hypothesis is posited:

**H1:** Opportunity-enhancing HR practices positively influence radical innovation.

### **2.5.2. The mediating role of exploration capability in the relationship between opportunity-enhancing HR practices and radical innovation**

Exploration capability is triggered by an individual's initiative to identify new business opportunities (Krueger et al., 2000). It is more likely that employees will seek and absorb unfamiliar knowledge and experiences when their work is flexible (Hackman & Oldham, 1980). Flexible positions establish an adaptive and open work structure and encourage employees to seek knowledge and technologies outside organizations (Erez, 2010; Krueger et al., 2000). Therefore, flexible job design allows employees to explore unfamiliar, distant, and remote knowledge that can transform the organization's value proposition (Amabile, 1998).

Getting employees involved in idea-generation and decision-sharing processes motivates them to come up with new business ideas (Yang & Konrad, 2011). Different points of view emerge and combine when employees from all levels of the organization participate. This makes it easier to find knowledge and technologies outside of the organization's fields of expertise (Shane, 2000). In addition, involved individuals with the autonomy to make decisions are likely to freely explore novel ways to improve organizations' performance (Spreitzer, 1995). Involving employees in the market is a necessity for systematically and continuously exploring customer needs, business environments, competitors, and technological changes (Martin et al., 1998).

The members of work teams often discuss the industry, market, and customer problems together, which leads to the discovery and definition of new business opportunities (Colarelli O'Connor & McDermott, 2004). Identifying novel knowledge and technological trajectories depends heavily on the use and circulation within work teams of previous knowledge (Jensen & Clausen, 2017). Firms use cross-functional teams to collect and develop market information (Martin et al., 1998). Empirically, it has been found that teamwork results in a greater ability of the firm to explore and understand markets (Atuahene-Gima, 1996).

Sharing knowledge reduces uncertainties about markets and technological changes, enabling organizations to explore new opportunities (Im & Rai, 2008). When knowledge is shared among individuals, learning occurs, which improves the firm's ability to respond to changing market conditions (Darroch & McNaughton,

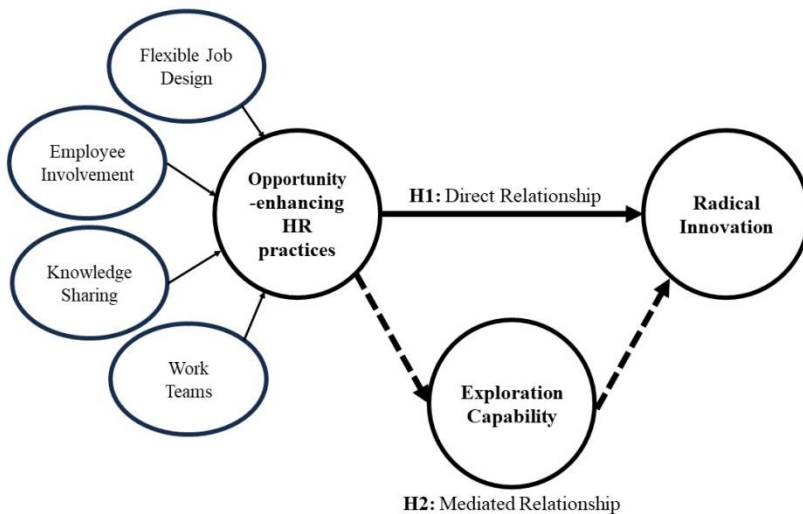
2002). Innovative technological trajectories are identified when individuals exchange and combine their knowledge and experiences (Im & Rai, 2008). Knowledge sharing promotes knowledge questioning and enhancing, which leads to an expanded market exploration (Farrell, 2000).

Organizations implementing opportunities-enhancing HR practices will be more able to identify, absorb, and internalize their accumulated knowledge (Curado & Bontis, 2011). Knowledge improvement at the individual level will facilitate learning at the collective level (Bontis et al., 2002). Strategic learning is essential (Vermeulen & Barkema, 2001), as it enhances knowledge acquisition and organizational transformation (Bontis et al., 2002). In addition to being a component of exploration capability, learning promotes radical innovation (Curado & Bontis, 2011). Many studies demonstrate that exploration capabilities enable organizations to develop radical innovations (Jurado-Salgado et al., 2024). According to theory, the generation, search, and learning of new knowledge enhance the development of new markets through radical innovations (Lennerts et al., 2020). Consequently, organizations must develop exploration capability before producing radical innovation (Naranjo-Valencia et al., 2017). Hence, the following hypothesis is formulated:

**H2:** Exploration capability mediates the relationship between opportunity-enhancing HR practices and radical innovation.

In Figure 1, the conceptual model tested in this study is presented.

**Figure 1.** Specific constructs and their relationships according to research hypotheses



Note: The study considers opportunity-enhancing HR as a reflective-formative model incorporating flexible job designs, employee involvement, knowledge sharing, and work teams.

Source: Author’s own elaboration.

### 3. Research methodology

#### 3.1. Sample and data collection procedure

Several researchers have examined exploration capability and innovation hypotheses in marketing and R&D-centric sectors (Wang & Rafiq, 2014). Hypotheses establishing a relationship between HR practices and organizational outcomes should also be evaluated in large companies. The study was conducted in large Colombian companies in telecommunications and chemical-pharmaceutical industries. They are based on scientific and technological networks that foster radical innovation (Li & Li, 2021). These sectors require innovation to achieve long-term competitiveness and sustainability (Jin & Shin, 2020).

External factors such as the COVID-19 pandemic have led to increased R&D investment in the pharmaceutical industry. Colombia is a leader in the region in this area, and this sector contributes substantially to the country's GDP (Conde-Gutiérrez, 2020). Regarding the telecommunications sector, Colombian exports of knowledge-based services experienced a substantial increase in 2021 (Ministerio de Tecnologías de la Información y las Comunicaciones [MINTIC], 2022). Both sectors in Colombia have a high innovation dynamic, which makes them suitable contexts for analyzing radical innovations.

In this study, 168 companies participated out of 184 large firms operating in both sectors in Colombia, indicating a response rate of 91%. 63% ( $n = 105$ ) of the participating companies are chemical-pharmaceutical companies, and 37% ( $n = 63$ ) are telecommunications-information technology companies. 73% ( $n = 123$ ) of the sample was founded in Colombia, while 27% ( $n = 45$ ) were founded abroad.

Three self-administered surveys were applied to measure the constructs intervening in the hypotheses: opportunity-enhancing HR practices, exploration capability, and radical innovation. Survey data were obtained between August and December 2022. All questionnaires received were completed. Those responsible for designing and implementing HR practices in their organizations were sent the survey on opportunity-enhancing HR practices. Commercial or marketing directors were sent the exploration capability survey since they know the organization's focus on identifying new business opportunities. The survey on radical innovation was mailed to directors, leaders, or coordinators of R&D or software product development, as they know the level and type of innovation the company conducts. The surveys were sent through the SurveyMonkey platform, allowing us to track each company's surveys. It is pertinent to notice that telephone reinforcement was used to encourage survey completion. Additionally, the fact that the three surveys were auto-administered by different top managers of the organizations is an advantage since it prevents bias.

## **3.2. Constructs measurement**

The measurement variables (items) for each construct are presented in Appendix A.

### **3.2.1. Opportunity-enhancing HR practices**

Opportunity-enhancing HR practices were measured through the Prieto and Santana Pérez (2012) scale. This measurement is a second-order construct integrated by the subdimensions: flexible job design, employee involvement, knowledge sharing, and work teams, defined in the theoretical framework (Jiang et al., 2012; Lepak et al., 2006). These opportunity-enhancing HR practices subdimensions comprise items 5, 5, 6, and 4, respectively. Based on their empirical study, Prieto and Santana Pérez (2012) found that the four constructs of opportunity-enhancing HR practices were reliable.

### **3.2.2. Exploration capability**

Exploration capability was measured through Zahra et al.'s operationalization (2000). This measurement is composed of five items. Zahra et al. scale for measuring exploration capability has demonstrated its validity and reliability in previous research (Jurado-Salgado et al., 2024).

### **3.2.3. Radical innovation**

Radical innovation was measured according to the scale designed by Subramaniam and Youndt (2005). This measure comprises three items, which has also demonstrated its validity and reliability in other studies (Menguc & Auh, 2010; Pérez-Luño & Cambra, 2013). All measurement items used in this study were evaluated using a 7-point Likert-type scale (ranging from 1: strongly disagree to 7: strongly agree).

### **3.2.4. Control variables**

The study controlled for the sector since its competitive dynamics may force a company to innovate radically. Furthermore, firms' origins were controlled, as foreign firms might have better capabilities and resources. These vari-

ables were categorical in the model. Company origins were categorized as foreign or Colombian (1 foreign, 0 Colombian). Moreover, organizations were categorized into two sectors: chemical-pharmaceutical and telecommunications (1 chemical-pharmaceutical, 0 telecommunications).

### 3.3. Data analysis technique

In this study, data analysis was performed by Structural Equation Modeling (SEM) with the Partial Least Square (PLS) technique. It is appropriate to use PLS-SEM when evaluating relationships that reflect novel theoretical developments, as in this study's hypotheses (Hair et al., 2017). PLS-SEM also makes it possible to evaluate complex theoretical models involving multiple variables (Hair et al., 2017), as shown in Figure 1. *Smartpls* version 4.0.9.6 was used to apply PLS-SEM.

PLS-SEM involves two analysis processes (Hair et al., 2017). The first involves evaluating the measurement model, which aims to evaluate the convergent and discriminant validity of the measures used in the study (Hair et al., 2017). Second, the structural model is evaluated to determine the relationships indicated in the research hypotheses (Hair et al., 2017). Next, we show these processes.

## 4. Results

### 4.1. Correlations between constructs and control variables

Correlations between the study constructs and control variables are presented in Table 1.

**Table 1.** Correlations between study constructs and control variables

| Control variables/Constructs | 1     | 2     | 3     | 4     | 5     | 6     | 7     |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|
| 1. Sector                    |       |       |       |       |       |       |       |
| 2. Origin                    | 0.13  |       |       |       |       |       |       |
| 3. Flexible job design       | 0.06  | 0.09  |       |       |       |       |       |
| 4. Employee involvement      | 0.09  | 0.12  | 0.67* |       |       |       |       |
| 5. Knowledge sharing         | 0.04  | 0.10  | 0.64* | 0.70* |       |       |       |
| 6. Work teams                | -0.02 | 0.06  | 0.63* | 0.66* | 0.71* |       |       |
| 7. Exploration capability    | 0.07  | 0.06  | 0.64* | 0.70* | 0.78* | 0.77* |       |
| 8. Radical innovation        | -0.00 | -0.01 | 0.64* | 0.49* | 0.58* | 0.53* | 0.63* |

\*  $p < .01$ .

Source: Author's own elaboration based on the obtained results of the empirical study.

Table 1 shows that the constructs involved in the research hypotheses, i.e., the constructs of interest in the study, are positively and significantly related. However, they did not relate to the control variables, such as sector and origin.

#### 4.2. Measurement evaluation for first-order constructs

Here are the results of evaluating the first-order measurement models: flexible job design, employee involvement, knowledge sharing, work teams, exploration capability, and radical innovation. PLS-SEM evaluates both convergent and discriminant validity of the measurement model. Convergent validity was evaluated using Standardized Loadings (SL) at the item level and Cronbach’s Alpha, Composite Reliability (CR), and Average Extracted Variance (AVE) at the construct level. As shown in Table 2, only one knowledge-sharing item was below the threshold of 0.7 recommended by the literature (Hair et al., 2017). However, it was accepted because the construct met the threshold for construct-level convergent validity. In this sense, most SL exceeded the 0.7 threshold and were significant. Likewise, the first-order constructs in Table 2 exceeded the recommended thresholds for Cronbach’s Alpha and CR, i.e., greater than 0.7. Regarding the AVE, these constructs exceeded the 0.5 value recommended by the PLS-SEM literature (Hair et al., 2017). Based on these results, we can conclude that the constructs measured in this study’s empirical phase have convergent validity.

**Table 2.** Convergent validity results according to PLS-SEM

| Constructs           | SL   | $\alpha$ | CR   | AVE  |
|----------------------|------|----------|------|------|
| 1                    | 2    | 3        | 4    | 5    |
| Flexible job design  | 0.84 | 0.87     | 0.91 | 0.67 |
|                      | 0.85 |          |      |      |
|                      | 0.77 |          |      |      |
|                      | 0.84 |          |      |      |
|                      | 0.79 |          |      |      |
| Employee involvement | 0.74 | 0.84     | 0.89 | 0.61 |
|                      | 0.81 |          |      |      |
|                      | 0.82 |          |      |      |
|                      | 0.77 |          |      |      |
|                      | 0.78 |          |      |      |
| Knowledge sharing    | 0.75 | 0.85     | 0.88 | 0.56 |
|                      | 0.80 |          |      |      |
|                      | 0.78 |          |      |      |
|                      | 0.68 |          |      |      |
|                      | 0.74 |          |      |      |
|                      | 0.74 |          |      |      |

**Table 2 cont.**

| <i>1</i>               | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> |
|------------------------|----------|----------|----------|----------|
| Work teams             | 0.87     | 0.81     | 0.87     | 0.64     |
|                        | 0.80     |          |          |          |
|                        | 0.79     |          |          |          |
|                        | 0.74     |          |          |          |
| Exploration capability | 0.90     | 0.91     | 0.93     | 0.74     |
|                        | 0.88     |          |          |          |
|                        | 0.86     |          |          |          |
|                        | 0.89     |          |          |          |
| Radical innovation     | 0.75     | 0.83     | 0.90     | 0.75     |
|                        | 0.90     |          |          |          |
|                        | 0.89     |          |          |          |
|                        | 0.81     |          |          |          |

Note: SL: Standard Loadings (Threshold > 0.7),  $\alpha$ : Alpha de Cronbach (Threshold > 0.7), CR: Composite Reliability (Threshold > 0.7), and AVE: Average Extracted Variance (Threshold > 0.5).

Source: Author's own elaboration based on the obtained results of the empirical study.

According to PLS-SEM literature, the Heterotrait Monotrait Ratio (HTMT) criterion should not exceed 0.9 for discriminant validity for first-order constructs (Hair et al., 2017). HTMT values did not exceed the threshold of 0.9 in pairwise comparisons, indicating discriminant validity (Table 3).

**Table 3.** Discriminant validity results

| Control variables/Constructs | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------------------------------|------|------|------|------|------|------|------|
| 1. Sector                    |      |      |      |      |      |      |      |
| 2. Origin                    | 0.13 |      |      |      |      |      |      |
| 3. Flexible job design       | 0.06 | 0.09 |      |      |      |      |      |
| 4. Employee involvement      | 0.10 | 0.14 | 0.76 |      |      |      |      |
| 5. Knowledge sharing         | 0.08 | 0.12 | 0.74 | 0.83 |      |      |      |
| 6. Work teams                | 0.02 | 0.07 | 0.75 | 0.78 | 0.86 |      |      |
| 7. Exploration capability    | 0.10 | 0.07 | 0.70 | 0.80 | 0.89 | 0.89 |      |
| 8. Radical innovation        | 0.06 | 0.02 | 0.75 | 0.62 | 0.77 | 0.67 | 0.77 |

Source: Author's own elaboration based on the obtained results of the empirical study.

### 4.3. Measurement evaluation for second-order construct

This study measured opportunity-enhancing HR practices using four constructs: work teams, flexible job design, employee involvement, and knowledge sharing. According to the literature on PLS-SEM, HR practices are considered a higher-order model since they contain subconstructs or subdimensions in order



to be measured (Hair et al., 2017). In light of the fact that opportunity-enhancing HR practices were measured by the four constructs mentioned, they should be addressed as a second-order model (Hair et al., 2017). Additionally, each construct of opportunity-enhancing HR practices is therefore considered a first-order model, which acts as a measurement indicator of the second-order model, as shown in Table 4.

For evaluating a second-order model as opportunity-enhancing HR practices, Sarstedt et al. (2019) indicate that it is imperative to examine its convergent validity, the collinearity between first-order constructs, and the significance and relevance of outer weights of first-order constructs respect to the second-order construct. Specifically, VIF is used in this context to ensure that constructs that encompass a second-order construct are not redundant (Kline, 2011). These results are shown in Table 4.

**Table 4.** Second-order construct assessment

| Second order construct             | First-order constructs as indicators | Outer weights | Significance T value | VIF  | $\alpha$ | CR   | AVE  |
|------------------------------------|--------------------------------------|---------------|----------------------|------|----------|------|------|
| Opportunity-enhancing HR practices | Flexible job design                  | 0.29          | 11.36*               | 2.11 | 0.89     | 0.92 | 0.75 |
|                                    | Employee involvement                 | 0.28          | 13.74*               | 2.47 |          |      |      |
|                                    | Knowledge sharing                    | 0.32          | 15.26*               | 2.74 |          |      |      |
|                                    | Work teams                           | 0.24          | 10.97*               | 2.45 |          |      |      |

\* Significance at 99% level (t value greater than 2,5).

Note: VIF: Variance Inflation Factor (Threshold < 5),  $\alpha$ : Alpha de Cronbach (Threshold > 0.7), CR: Composite reliability (Threshold > 0.7), and AVE: Average Extracted Variance (Threshold > 0.5).

Source: Author’s own elaboration based on the obtained results of the empirical study.

Regarding convergent validity, the second-order model exceeded Cronbach’s Alpha and CR thresholds, Hair et al. (2017) suggested. They surpass the 0.7 threshold recommended. Furthermore, the weights of the first-order constructs in relation to the second-order construct were significant, and there were no collinearity issues between first-order constructs. There were no VIF values above five, as suggested by PLS-SEM (Hair et al., 2017), which indicates that first-order constructs are not redundant. Therefore, HR practices that encompass opportunity-enhancing HR practices are different. Accordingly, the second-order model achieved the convergent validity suggested by Sarstedt et al. (2019) and also contained relevant but distinct constructs.

#### 4.4. Structural model assessment

Table 5 presents the results obtained using the PLS-SEM method for evaluating the structural model, i.e., testing the hypotheses. Opportunity-enhancing HR practices significantly and positively influence radical innovation ( $\beta$ : 0.44;  $t$ : 3.5). This supports Hypothesis 1. Also, it was found that exploration capability partially mediates the relationship between opportunity-enhancing HR practices and radical innovation ( $\beta$ : 0.26;  $t$ : 2.7), which supports Hypothesis 2. The partial mediation of exploration capability results from the significant relationship between opportunity-enhancing HR practices and radical innovation. As a result of controlling for sector and origin, radical innovation was not significantly influenced.

Furthermore, the results showed predictive power within and outside the sample. Within the sample,  $R^2$  values for dependent constructs (exploration capability and radical innovation) exceeded the 0.1 threshold suggested by the PLS-SEM literature (Hair et al., 2017). In the second case, outside the sample, the  $Q^2$  values for dependent constructs were greater (Table 5) than the threshold of 0 recommended by PLS-SEM literature (Hair et al., 2017).

**Table 5.** Structural model evaluation

| Hypothesis   | Relationship                                       | Path coefficient | T Value | Decision    |
|--|--|------------------|---------|-------------|
| Direct effects   |  |                  |         |             |
| H1   | OHRP→Radical innovation                            | 0.44             | 3.5*    | Supported   |
| Indirect/Mediating effects   |  |                  |         |             |
| H2   | OHRP→exploration capability→<br>radical innovation | 0.26             | 2.7*    | Supported   |
| Control variables  |  |                  |         |             |
| Sector→radical innovation  |  | -0.063           | 0.50**  | Not related |
| Origin→radical innovation  |  | -0.22            | 1.40**  | Not related |
| Exploration capability: $R^2 = 0.63$ ; $Q^2 = 0.62$<br>Radical innovation: $R^2 = 0.53$ ; $Q^2 = 0.46$ |  |                  |         |             |

\*  $t$  values surpass the threshold of 2.5, meaning a significance level at 99%.

\*\*  $t$  values did not reach the threshold of 1.65, meaning they are insignificant.

Source: Author's own elaboration based on the obtained results of the empirical study.

## 5. Discussion

This study evaluated the influence of opportunity-enhancing HR practices on radical innovation. In addition, it evaluated the mediating role of exploration capability in this relationship. Accordingly, this article answered two main research questions: What is the influence of opportunity-enhancing HR practices on radical innovation? Moreover, how does exploration capability mediate the relationship

between opportunity-enhancing HR practices and radical innovation? As a result, two hypotheses were posited and tested in this study: the first hypothesis asserts that opportunity-enhancing HR practices positively influence radical innovation. In contrast, the second argues that exploration capability mediates the relationship between radical innovation and opportunity-enhancing HR practices. These hypotheses were formulated Using the RBV principles as a theoretical rationale.

This research found a positive and significant influence of opportunity-enhancing HR practices on radical innovation. Additionally, exploration capability mediates this relationship. Regarding the first result, this was in line with previous literature that indicates that opportunity-enhancing HR practices, such as flexible job design, employee involvement, work teams, and sharing knowledge, benefit radical innovation development (Abernathy & Clark, 1985; Colarelli O'Connor & McDermott, 2004; Eisenhardt & Martin, 2000; Miron-Spektor et al., 2011; Shahriari et al., 2018; Zhou & Li, 2012). The second result connects with previous literature that indicates that the examined group of HR practices enables exploration capability (Amabile, 1998; Atuahene-Gima, 1996; Erez, 2010; Im & Rai, 2008; Martin et al., 1998; Spreitzer, 1995) which is a necessary capability to generate radical innovations in organizations (Jurado-Salgado et al., 2024; Lennerts et al., 2020; Naranjo-Valencia et al., 2017).

According to this study, first, flexible job design, as an opportunity-enhancing human resource practice, is fundamental to consolidating radical innovations since it is a type of innovation that requires voluntary employee participation in various product and service development projects (Colarelli O'Connor & McDermott, 2004; & McDermott, 2004). In many of these, employees act deliberately, intuitively, and quickly to respond to the uncertainty involved in developing novel products and services, which would not be possible if they followed a fixed work routine (Eisenhardt & Martin, 2000). Radical innovations require people who take risks and change the normal course of work in organizations, so a flexible job structure or design is essential (Amabile, 1998). To achieve radical innovations, it is impossible to count on people who come to the organization every day to perform the same tasks since this is more related to the continuity of the traditional business approach than the proactive search for new businesses (Stringer, 2000). Second, as radical innovation is highly dependent on originality in idea generation, opening up spaces for employee involvement is critical (Shahriari et al., 2018). Through these spaces, diverse employees from different business activities are freely and spontaneously involved, combining knowledge and experiences consolidated into products, services, and business models new to the organization (Colarelli O'Connor & McDermott, 2004; & McDermott, 2004; Van de Vrande et al., 2009). Thirdly,

radical innovation is based on the formation of work teams because employees working together and focused on specific objectives encourage the combination of knowledge, experiences, curiosity, and solutions that facilitate the generation and commercialization, with lower risk, of new products and services for the market (Miron-Spektor et al., 2011; Stringer, 2000). In particular, team diversity is essential to generate radical innovations since the complexity of these innovations requires the combination of different experiences and competencies to adjust products and services according to market needs (Cabralés et al., 2008). Finally, radical innovations rely on original knowledge generation, which is supported by knowledge sharing in the organization by employees, especially of the tacit type (Colarelli O'Connor & McDermott, 2004; Ritala et al., 2018; Stringer, 2000). This means that knowledge sharing among employees will produce original ideas and new capabilities that derive radical innovations (Zhou & Li, 2012). Knowledge sharing is a necessary practice to assess how an organization can expand its vision of developing new products and markets (Stringer, 2000).

In addition, the results of this study also suggest that opportunity-enhancing HR practices drive exploration capability, which allows radical innovations to be developed. Moreover, flexibly designed jobs influence and foster employees' willingness to seek upcoming technologies and knowledge outside the scope of the organization (Erez, 2010; Hackman & Oldham, 1980; Krueger et al., 2000). Moreover, when employee involvement is established in the organization, employees are mobilized to seek solutions to business and market problems in a purposeful and voluntary manner (Yang & Konrad, 2011). This leads to an active exploration of customer needs, the business environment, competition, and technological changes (Martin et al., 1998). Employee involvement makes it easier for the company to identify relevant knowledge and technologies outside the organization (Shane, 2000). Likewise, the discussions among team members about the industry, the market, and customers, in a joint way, lead to the discovery of new business opportunities (Colarelli O'Connor & McDermott, 2004; Jensen & Clausen, 2017). This allows for obtaining more information about the market, which amplifies the company's capability to explore and understand it through trends in product and service technologies (Atuahene-Gima, 1996). Consequently, work teams foster knowledge sharing that reduces uncertainty about market and technology changes, facilitating the generation of new business opportunities (Im & Rai, 2008). Shared knowledge implies organizational learning that enables the company to propose changes in the market or respond to them when they are proposed by other organizations (Darroch & McNaughton, 2002). Therefore, knowledge sharing enables the identification of novel technological trajectories, which means market exploration has been put into practice (Farrell, 2000).

The company's exploration capability is consolidated through the above practices, focused on improving the employee's opportunity to contribute (Curado & Bontis, 2011). This leads to cutting-edge knowledge and technologies being generated, sought and learned collectively, and used to develop radical innovations (Bontis et al., 2002). This learning then leads to the production of new markets, products, and services (Lennerts et al., 2020). Therefore, exploration is an essential capability that makes the generation of radical innovations possible (Jurado-Salgado et al., 2024; Naranjo-Valencia et al., 2017).

It is essential to highlight that this study is an original contribution to theory and research on the relationship between HR practices and innovation from two perspectives. First, it is novel in studying the relationship between HR practices and radical innovation, a phenomenon that has not been sufficiently studied in previous research (Le & Son, 2024; Seeck & Diehl, 2017; Thneibat et al., 2022). Second, it is pioneering in empirically assessing the relationship between HR practices, exploration capability, and radical innovation, corresponding to a theoretical gap identified in the innovation literature (Le & Le, 2023; Than et al., 2023).

Regarding the first perspective, this study presents empirical evidence of the type of specific HR practices that influence radical innovation. It extends beyond the simplistic assumption that all HR practices make this innovation possible. This study empirically confirms opportunity-enhancing HR practices as an essential mechanism for fostering radical innovation. This study then establishes the usefulness of this type of HR practice concerning specific innovation results, which has not been done in previous studies (Chowhan, 2016). In the literature on HR management, opportunity-enhancing HR practices have been disseminated as mechanisms that allow the individual within the organization to produce extraordinary results without specifying what these results are (Jiang et al., 2012). According to the literature, opportunity-enhancing HR practices seem innovation-oriented. However, this approach has not been confirmed as theoretically and empirically as in this study.

This study theoretically establishes how HR practices, exploration capability, and radical innovation are related to the second perspective. It presents empirical evidence on how these constructs behave as a whole. This study shows that specific HR practices, such as opportunity-enhancing HR practices, indirectly affect radical innovation through exploration capability. From a theoretical perspective, this article clarifies the process that makes radical innovations possible from an HR management perspective. This is because opportunity-enhancing HR practices facilitate the implementation of the exploration capability in organizations, i.e., they encourage experimentation, the absorption of new knowledge, the assumption of risks, and the acquisition of new technologies, a necessary step to

achieve radical innovations. The evidence on the systematic relationship among these three constructs is a novel contribution that has not been addressed in previous studies since most of them raise the importance of HR practices implementation but leave aside the understanding of how these become business capabilities that improve innovation results (Beddow, 2021; Cao et al., 2021; Le & Le, 2023).

Finally, this research pioneers a shift in the way research is conducted on the relationship between HR practices and innovation. Research on this relationship should account for the specific HR practices to be implemented according to the type of innovation addressed. This article provides a foundation for improving theory specifying contingency relationships between constructs. Theoretical work is crucial in this regard to connect both constructs appropriately and, thus, not fall into the theoretical generalization of considering that all HR practices contribute to any innovation.

## 6. Conclusions

First, the results of this study indicate that opportunity-enhancing HR practices positively and significantly influence radical innovation. Additionally, it was demonstrated that exploration capability is a mediator of this relationship. In line with these results, this study has practical implications for top management, the HR function, and line managers, which must be highlighted. First, top management must understand that specific organizational capabilities, such as exploration, must be improved and developed to achieve radical innovations. In addition, they must be clear that exploration is a capability that depends on the way how employees are managed through HR practices. Therefore, top management must promote implementing opportunity-enhancing HR practices, which must be aligned with establishing a flexible organizational culture focused on recognizing customer needs and external technological changes in the market.

Second, HR leaders, according to the results of this study, should be aware that the development of organizational capabilities such as exploration, as a means to achieve radical innovations, requires HR practices that transcend the traditional approach (recruitment, selection, employee development, training, performance evaluation, incentives), since it is not enough to improve the motivation and competencies of the individual. It requires HR practices that enhance and encourage employees' use of these two characteristics in a free and discretionary manner, such as opportunity-enhancing HR practices.

Third, line managers or team leaders play a major role in influencing opportunity-enhancing HR practices. These practices change the way employees work, so it is up to line managers or team leaders to ensure that jobs are designed to be flexi-

ble, that participation in decision-making is encouraged, that knowledge is shared, and that teams are built with clearly defined objectives. In a complementary way, implementing these practices requires a specific leadership style from line managers that motivates, inspires, intellectually stimulates, and identifies employee strengths.

This leads us to consider the following specific actions for business management in light of the findings of this study. First, the organization's top management needs to recognize the importance of radical innovation in its strategic planning. As this is a high-risk exercise for the organization, key managers involved in the strategy planning process should establish specific goals for radical innovations in terms of time and commercial impact. From this perspective, the organization at the management level establishes clear awareness that radical innovations should be pursued as part of the company's strategic exercise. The HR department must educate employees about radical innovations' strategic relevance.

Second, the HR department and the specific managers who lead key organizational activities or processes should establish a call to link exceptional talent in developing radical innovations. The purpose is to form work teams focused on these innovations. Talent recruitment should be voluntary, but the company's HR department should guide the formation of teams. In this way, each team must comprise employees from various professions, skills, and backgrounds.

Third, HR departments and key managers are responsible for ensuring that exploration teams have an environment conducive to exploration activities. Therefore, the workload of team members must not obstruct these activities. It must also be ensured that they have the necessary resources to explore. Likewise, leaders must be identified in these teams who can set goals and control the progress of exploration activities. They should evaluate whether the teams need more members or a change in working methods. Additionally, HR should supervise exploration activities within work teams. It should also encourage free participation and promote knowledge sharing within them. As a final step, the HR department, team leaders, and key managers of the organization must select initiatives derived from the exploration activity, which will become radical innovation projects. This may involve other organization members. It is necessary for firms to evaluate how these projects will impact the organization's performance since revenues are expected to increase through the commercialization of original products and the conquest of markets not explored by the organization.

Finally, this study has limitations that should be considered when interpreting the results. First, it was conducted in large companies that use information and knowledge intensively. This indicates that the results cannot be generalized to other sectors and companies of other sizes. Second, the survey data is cross-sectional, so causal inferences cannot be made from the results. Third, theoretic-

cally, it evaluates only one group of HR practices since traditional practices are omitted. Fourth, it also limits exploration as an organizational capability that acts as a mediating construct between opportunity-enhancing HR practices and radical innovation. This leads to considering future studies in which other organizational constructs that mediate the relationship between opportunity-enhancing HR practices and radical innovation can be established and tested since, in this study, exploration capability was only a partial mediator. Fifth, there is also a limitation regarding there is also a limitation regarding radical innovation measurement. We measured this variable using Subramaniam and Youndt's (2005) scale. An essential aspect of this measurement is determining if a company has the potential to develop radical innovations. Thus, this measurement does not establish whether radical innovations were commercially successful. Therefore, future studies should measure radical innovation based on output-related indicators.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Appendix A

**Table 6.** Measurements

| Construct            | Item/Variable  | Source                  |
|----------------------|--|-------------------------|
| 1                    | 2  | 3                       |
| Flexible job design  | <p>Our company emphasizes employees' job rotation and flexible work assignments in different work areas.</p> <p>Our company transfers extensively different tasks and responsibilities to employees.</p> <p>Our company emphasizes employees' teamwork and network collaboration.</p> <p>Employees in this organization have broadly designed jobs requiring a variety of skills.</p> <p>Employees in this company are allowed to make decisions</p>   | Prieto and Pérez (2012) |
| Employee involvement | <p>Employees are provided the opportunity to suggest improvements in the way things are done.</p> <p>Employees are invited to participate in a wide range of issues, including performance standards, quality improvement, benefits, etc.</p> <p>Employees are invited to participate in problem solving and decisions.</p> <p>Employees receive information on the relevant concerns of the company (goals, performance, etc.).</p> <p>Supervisors keep open communications in this company</p> | Prieto and Pérez (2012) |



**Table 6 cont.**

| 1                      | 2  | 3                             |
|------------------------|--|-------------------------------|
| Knowledge sharing      | <p>Employees share information and learn from one another.</p> <p>Employees apply knowledge from one area of the organization to solve problems and opportunities that arise in another.</p> <p>Employees are skilled at collaborating with each other to diagnose and solve problems.</p> <p>Employees interact and exchange ideas with people from different areas of the organization.</p> <p>Employees interact with customers, suppliers, partners, etc., to develop solutions.</p> <p>Employees in the organization share a commonality of purpose and collective aspirations with others at work</p>  | Prieto and Pérez (2012)       |
| Work teams             | <p>Employees have confidence in other employees' intentions and behavior.</p> <p>Employees view themselves as partners in charting the direction of the organization.</p> <p>Employees are aware and committed to the purpose and collective aspirations of the organization.</p> <p>Employees in this organization have relationships based on trust and reciprocal faith.</p>  | Prieto and Pérez (2012)       |
| Exploration capability | <p>Explored new products and/or markets unknown for the firm (evaluate it over the last three years according to the firms' activities).</p> <p>Acquired entirely new managerial and organizational skills (evaluate it over the last three years according to the firms' activities).</p> <p>Acquired products and manufacturing technologies entirely new to the firm (evaluate it over the last three years according to the firms' activities).</p> <p>Strengthened innovation skills in areas where it had no prior experience (evaluate it over the last three years according to the firms' activities).</p> <p>Acquired for the first-time skills in financing new technologies and improving human capital in research and development and engineering (evaluate it over the last three years according to the firms' activities)</p> | Zahra et al. (2000)           |
| Radical innovation     | <p>Innovations that make your prevailing product/services lines obsolete (How would you rate your organization's capability to generate these types of innovations in the last five years?).</p> <p>Innovations that fundamentally change your prevailing products/services (How would you rate your organization's capability to generate these types of innovations in the last five years?).</p> <p>Innovations that make your existing expertise in prevailing product/ services obsolete (How would you rate your organization's capability to generate these types of innovations in the last five years?)</p>   | Subramaniam and Youndt (2005) |

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