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## A Literature Review of HRM Systems and Firm Innovation

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## ORIGINAL ARTICLE

# A Literature Review of HRM Systems and Firm Innovation

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### Abstract

**Background and objective:** This paper integrated different theoretical perspectives and investigated how, when, and why human resource management (HRM) systems influence different types of firm innovation. Moreover, this paper presented the current dilemma and future research directions in the field of HRM systems and firm innovation.

**Methods:** A thorough literature review.

**Results:** In the HRM system perspective, there are three main types of firm innovation: innovation in products or services, innovation in processes, and innovation in people and organizations. Empirically, researchers have considered organizational capacity, capital, and climate both as moderators and mediators to explain the relationship between HRM systems and different types of firm innovation.

**Conclusions:** After a thorough literature review, the author suggested some insightful future research directions. For example, more HRM research is needed for the fields of innovation in processes and innovation in people and organization.

**Contribution/value:** This paper provides a neat and organized review of firm innovation from the HRM view. It clarifies what has been done and what needs to be done. For example, future HRM researchers may explore that if organizational capacity, capital, and climate should be moderators or mediators or both in the relationships between HRM systems and different types of firm innovation.

**Keywords:** Human resources, HRM systems, Firm innovation, Literature review

**JEL classification:** O15, O31, O32

### Introduction

Human resource management (HRM) integrates firm micro- and macro-resources. Markoulli et al. (2017) reviewed and identified future research directions in different HRM clusters. One of their main suggestions was to study the strategic role of HRM and how HRM connects with firm innovative behaviors, innovation capability, and innovative strategy. Similarly, Bailey et al. (2018) and Jackson et al. (2014) called for more papers to systematically review and test relationships between HRM and firm innovation. Following these directions, researchers have written review papers, theoretical papers, empirical papers, book chapters, and case studies about HRM and firm innovation. Despite the relatively small numbers of review papers, researchers have

reviewed HRM and firm innovation with different foci. For example, Trivedi and Srivastava (2021) applied knowledge management theories and suggested a theoretical framework that HRM systems influence innovation performance through knowledge management processes. Sharma and Sharma (2018) reviewed 30 research papers and suggest positive relationships between HRM systems and organizational innovation. Easa and El Orra (2021) conducted a content analysis with 31 peer-reviewed articles and found a solid association between HRM systems and product innovation. They recommended future researchers to include more papers and explore the relationship between HRM systems and process innovation.

Given its importance and existing literature, the field of HRM systems and innovation can be

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developed from the following perspectives: 1) Review the general literature of innovation and identify the innovation taxonomy that applies specifically to HRM; 2) Conduct a literature review with a larger number of papers; 3) Review the literature of HRM and consider different types of innovation (innovation taxonomy); 4) Examine the mechanisms and contexts for relationships between HRM systems and firm innovation; 5) Present more future research directions.

In this paper, I briefly reviewed firm innovation across disciplines and extracted the categorization results from some major meta-analysis studies of firm innovation in different academic fields. With these insights, I provided an in-depth review between human resource management (HRM) systems and firm innovation by exploring the following questions: What are the main supporting theories that explain the relationships between HRM systems and firm innovation? Which categories of firm innovation do HRM systems have effect on? What are the mediators and moderators that explain how and when HRM systems influence different categories of firm innovation? What are future research directions in the field of HRM systems and firm innovation?

This paper contributed to the literature in the following ways: 1) It identified that the resource-based view, dynamic capabilities, behavioral view of firms, organizational learning theory, social exchange theory, motivation theory, and strategic human resource management are major theories that researchers used when studying HRM systems and firm innovation; 2) It classified three categories of innovation from the HRM perspective—innovation in people and organizations, innovation in processes, and innovation in products or services; 3) It presented mediators (i.e. organizational capacity and organizational climate) and moderators (i.e. organizational strategy and organizational capital) that researchers used in the field of HRM systems and firm innovation; and 4) It suggested five themes of future research directions for researchers who are interested in HRM systems and firm innovation.

## 1 Firm innovation in literature

A classic definition of firm innovation is given by Knight (1967). He reviewed innovation from the psychological, economic and sociological perspectives, and defined firm innovation as “the adoption of a change which is new to an organization and to the relevant environment (p. 478).” Moreover, Knight (1967) suggested that firm innovation can be categorized by functional differences and the degree of radicalness. The four functional types of firm innovation include:

product or service innovation, production process innovation, organizational structural innovation, and people innovation. For degree of radicalness, Knight (1967) identified two aspects: performance radicalness and structural radicalness. Both indicate the degree of changes an innovation would bring compared to the existing approach. Based on the study purposes, researchers might use innovation as a uni-dimensional construct (Calantone et al., 2010; Wang et al., 2015).

Meta-analysis studies provide a robust picture of research progresses for a specific topic. Table 1 presented the categories and definitions of firm innovation from some highly influential meta-analysis papers of firm innovation. As shown in Table 1, firm innovation can be categorized roughly as product or service innovation, production process innovation, administrative innovation, technical innovation, radical innovation, incremental innovation, innovation orientation, and innovation capability. Among these types of firm innovation, product or service innovation and production process innovation are studied most. As Knight (1967) pointed out, the categorizations of firm innovation are overlapped and interrelated. For example, both administrative innovation and technical innovation are related with the organizational structure and decision-making process within an organization (Damanpour, 1991). These two dimensions of innovation are highly overlapped with process innovation, organizational structure innovation, and people innovation (Knight, 1967). The overlapping constructs of firm innovation can be due to intrinsic and internal dependence of different types of innovation (Sarooghi et al., 2015). For example, innovation in the production process may result from an innovation in organizational structure.

Other than conceptual similarities of firm innovation categories, divergence comes from researchers' different theoretical backgrounds. In the literature, firm innovation has been studied in strategy (Li et al., 2015; Ma Prieto & Pilar Perez-Santana, 2014; Yanadori & Marler, 2006), human resource management (Chow & Liu, 2009; Zhang & Li, 2009), entrepreneurship (Chandler et al., 2000; Rosli & Mahmood, 2013; Zhang et al., 2016), operations management (Hoang et al., 2006; Perdomo-Ortiz et al., 2009; Sadikoglu & Zehir, 2010), marketing (Stock & Zacharias, 2011; van der Borgh & Schepers, 2018; Wei & Atuahene-Gima, 2009), organizational behavior (Bhatnagar, 2014; Popa et al., 2017; Sharifirad & Ataei, 2012), and knowledge management (Donate & de Pablo, 2015; Özbağ et al., 2013; Yang, 2010).

To enhance the field specific understanding of firm innovation, I applied insights from the general

Table 1. Categories and definitions of firm innovation from several influential meta-analysis papers of firm innovation.

<b>Product or Service Innovation</b>	
new products or services introduced to meet an external user or market need	Damanpour (1991)
the development of new products or services aimed at answering a market need and increasing the firm's power	Camison-Zornoza et al. (2004)
the introduction of a new product to the marketplace	Vincent et al. (2004)
new products or services that are internally developed or externally purchased to meet user needs	Lee and Xia (2006)
innovation primarily involved a product/service	Bowen et al. (2010)
novel products or services that are introduced into the market to meet customer needs	Saroghi et al. (2015)
the development of new or enhanced offerings that involves the firm's performance of a task/activity intended to benefit customers and firm economic performance	Storey et al. (2016)
the introduction of new products or services to meet external market or user needs	Rousseau et al. (2016)
<b>Production Process Innovation</b>	
new elements introduced into an organization's production or service operation	Damanpour (1991)
new elements, equipment or methods introduced into the firm's production system to develop a product or service	Camison-Zornoza et al. (2004)
new elements that are brought into an organization's production or service operations	Vincent et al. (2004)
new business processes that organizations use to generate products and/or deliver services	Lee and Xia (2006)
innovation primarily involved a product/service process	Bowen et al. (2010)
innovation in process	Rosenbusch et al. (2011)
the development of new products	Evanschitzky et al. (2012)
deliberate and new organizational attempts to change intra-company production and service processes to make them more efficient	Saroghi et al. (2015)
the introduction of new elements such as systems, equipment, materials, information, and work practices used to produce a product or service	Rousseau et al. (2016)
<b>Administrative Innovation</b>	
innovation in organizational structure and administrative processes	Damanpour (1991)
innovation in the coordination and control of the firm, the structure and management of the organization, the administrative processes, and human resources	Camison-Zornoza et al. (2004)
innovation that occurs in the social system, or the relationships among people who interact to accomplish a particular goal, of an organization	Vincent et al. (2004)
<b>Technical Innovation</b>	
innovation in products, services, and production process technology	Damanpour (1991)
innovation in productive process and is closely linked with the core activity of the organization	Camison-Zornoza et al. (2004)
innovation that occurs in the technical system of an organization and is directly related to the primary work activity of the organization	Vincent et al. (2004)
<b>Radical Innovation</b>	
innovation that produces fundamental changes in the activities of an organization and represents clear departures from existing practices, and variation and routine	Damanpour (1991)
fundamental changes in the activities of an organization or industry with respect to current practices	Camison-Zornoza et al. (2004)
fundamentally change the activities of an organization and represent clear departures from the previous way of conducting business	Vincent et al. (2004)
innovation that challenges existing approaches	Mueller et al. (2013)
innovation that generates fundamental and exploratory changes	Chang et al. (2014)
<b>Incremental Innovation</b>	
innovation that results in little departure from existing practices	Damanpour (1991)
changes that enhance the capacities already present in the organization and have a low degree of departure from existing practices	Camison-Zornoza et al. (2004)
innovations that do not cause significant departure from the status quo	Vincent et al. (2004)
innovation that builds on improvements and refinements of current skills and processes	Mueller et al. (2013)
innovation that generates exploitative changes	Chang et al. (2014)
<b>Innovation Orientation</b>	
the tendency to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, technological processes	Rosenbusch et al. (2011)
<b>Innovation Capability (Innovativeness)</b>	
the rate of innovation adoption and the willingness to change	Calantone et al. (2002)

literature of firm innovation and only examined firm innovation from the human resource management theoretical and empirical perspectives. In the following sections, I identified the main theories that

support the relationships between HRM systems and firm innovation, three categories of firm innovation that HRM researchers have explored on, mediators and moderators that explain how and when HRM

systems influence firm innovation, and the current gaps and future research directions in the specific field of HRM systems and firm innovation.

## 2 Human resources management systems and firm innovation

Firms have three main types of resources: physical capital resources, organizational capital resources, and human capital resources (Barney, 1991). Human resource management refers to the management planning, strategy, investment, and practices of firm human capital resources, which include employees' knowledge, skills, and abilities (Crook et al., 2011). Traditional human resource management researchers focused mainly on the influence of individual human resource practices. About two decades later, researchers began to hold a strategic view of human resource management and explored how human resource configurations facilitated firm strategic goals. At this point, researchers shifted their attention from the impact of individual HR practices to the effectiveness of human resource practice bundles or systems (Jiang et al., 2012). A HRM system includes at least three individual HR practices (Posthuma et al., 2013). A main goal of current human resource management researchers is to continuously explore the relationship between human resource management and firm innovation (Bailey et al., 2018; Jackson et al., 2014). To contribute to this goal, I conducted a thorough review of the literature from different databases: Core, Directory of Open Access Journals, EBSCO, Emerald Insight, Google Scholar, JSTOR, ProQuest, SAGE, Science Direct, Social Science and Research Network, Springer Link, Taylor & Francis Online, and Wiley. The searching keywords for firm innovation included "innovate," "innovation," "innovative," "innovativeness," "new product," and "new process." The searching keyword for human resource management systems included "human resource," "high performance work systems," "high involvement work systems," "high commitment work systems," "HR," "HPWS," "HIWS," and "HCWS." In total, I found 105 quantitative empirical papers, 31 qualitative empirical papers, 38 literature review and case studies, and 10 editorial letters and book chapters. Key supporting theories came directly from these papers. Firm innovation categories from the HRM systems view (Table 2) integrated insights from the meta-analysis studies of firm innovation across disciplines and the direct inputs from the selected papers. Mediator and moderator categories (Table 3 and Table 4) shared similar situations. For future research directions, I referred to what the selected papers suggested and my reflections from writing this literature review.

Table 2. Categorizations of firm innovation in HRM systems studies.

<b>Innovation in People and Organizations</b>
Current exploration strategy (Ko & Ma, 2019)
Exploitation (Para-González et al., 2018)
Exploration (Para-González et al., 2018)
Innovation (Razouk, 2011)
Innovation orientation of strategy (Stock & Zacharias, 2011)
Innovation strategy (Jimenez-Jimenez & Sanz-Valle, 2005; Zhang & Li, 2009)
Innovation: New clients (Fu, 2015)
Innovative climate (Kang, 2015)
Innovative culture (Song et al., 2019)
Innovativeness (Collins, 2000)
Marketing Innovation (Ceylan, 2013)
Organizational ambidexterity (Patel et al., 2013)
Organizational innovation (Ceylan, 2013; Messersmith & Guthrie, 2010; Rasheed et al., 2017)
Product market strategy: Innovation (Chang & Huang, 2005)
Support for innovation climate (Liu et al., 2017)
<b>Innovation in Processes</b>
Administrative innovation (Jimenez-Jimenez & Sanz-Valle, 2008)
Administrative innovation (Mavondo et al., 2005)
Incremental process innovation capacity (Smith et al., 2012)
Innovation capability (Chang et al., 2019)
Organizational innovation (Messersmith, 2008)
Process innovation (Ceylan, 2013)
Process innovation (Jimenez-Jimenez & Sanz-Valle, 2007, 2008; Mavondo et al., 2005; Messersmith, 2008; Messersmith & Guthrie, 2010; Nieves et al., 2016)
Process innovation performance (Smith et al., 2012)
Product and process innovation (Al-Tal & Emeagwali, 2019)
Radical process innovation capacity (Smith et al., 2012)
<b>Innovation in Product or Service</b>
Firm innovation (Do, 2017)
Firm innovation capabilities (Donate et al., 2016)
Firm innovation performance (Li et al., 2019)
Firm innovativeness (Chang et al., 2013)
Firm performance: Revenue from new product and service (Collins & Smith, 2006)
Incremental innovation (Para-González et al., 2018)
Incremental innovative capability (Wang & Chen, 2013)
Incremental product innovation capacity (Smith et al., 2012)
Innovation (Armstrong et al., 2010; Gahan et al., 2020; Nasution et al., 2011; Nieves & Osorio, 2017; Papa et al., 2018; Sheehan, 2014; Zhou et al., 2013)
Innovation capacities (Boehm et al., 2014)
Innovation conceptual index (Messersmith, 2008)
Innovation index (Messersmith & Guthrie, 2010)
Innovation performance (Ceylan, 2013; Chen et al., 2018; Donate & Guadamillas, 2015; Kang, 2015; Kianto et al., 2017; Olander et al., 2015; Soo et al., 2017; Soto-Acosta et al., 2017)
Innovation results (Donate & Guadamillas, 2011)
Innovation: Exploitative capability (Zhang et al., 2016)
Innovation: Explorative capability (Zhang et al., 2016)
Innovation: New services (Fu, 2015)
Innovative activities (Lopez-Cabrales et al., 2009)
Innovative business (Lepak et al., 2007)
Innovative capability (Botelho, 2020)
Knowledge exploitation practices (Donate & Guadamillas, 2011)
Knowledge exploration practices (Donate & Guadamillas, 2011)
New product (Im et al., 2013)
New product program frequency (Stock & Zacharias, 2011)
New product program newness (Stock & Zacharias, 2011)

(continued on next page).



Table 2. (Continued).

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New product program value (Stock & Zacharias, 2011)
Organizational ambidexterity (Gürlek, 2020)
Organizational ambidexterity performance: Incremental product innovation (Patel et al., 2013)
Organizational ambidexterity performance: Radical product innovation (Patel et al., 2013)
Organizational innovation (Chen et al., 2019; Soto-Acosta et al., 2016; Zhou et al., 2019)
Product innovation (Adebanjo et al., 2020; Ceylan, 2013; Jimenez-Jimenez & Sanz-Valle, 2007, 2008; Mavondo et al., 2005; Messersmith, 2008; Messersmith & Guthrie, 2010; Nieves et al., 2016; Wei et al., 2011)
Product innovation performance (Smith et al., 2012; Tang et al., 2015)
Radical innovation (Para-González et al., 2018)
Radical innovative capability (Wang & Chen, 2013)
Radical product innovation capacity (Smith et al., 2012)
Total number of innovations (Collins, 2000)
Workforce innovation (Liu, 2011)

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Table 3. Categories of mediators.

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<b>Organizational Capacity</b>
Absorptive capacity (Chang et al., 2013; Soo et al., 2017)
Dynamic capabilities (Gahan et al., 2020)
Knowledge exchange and combination (Collins & Smith, 2006)
Knowledge integration and adaptative capability (Chen et al., 2019)
Knowledge management capacity (Al-Tal & Emeagwali, 2019)
Knowledge management practices (Jimenez-Jimenez & Sanz-Valle, 2007)
Organizational knowledge-creation capability (Collins, 2000)
Social web knowledge sharing (Soto-Acosta et al., 2017)
The use of e-business (Soto-Acosta et al., 2016)
<b>Organizational Capital</b>
Collective human capital resource (Do, 2017)
Declarative knowledge and procedural knowledge (Nieves et al., 2016)
Employees' innovative work behaviors (Fu, 2015)
Human capital (Donate et al., 2016)
Intellectual capital (Al-Tal & Emeagwali, 2019; Gürlek, 2020; Kianto et al., 2017; Wang & Chen, 2013)
Middle managers' innovative behaviors (Chen et al., 2018)
<b>Organizational Climate</b>
Climate for initiative and climate for psychological safety (Do, 2017)
Employee voice (Rasheed et al., 2017)
Innovation climate (Kang, 2015)
Perceptions of social exchange (Boehm et al., 2014)
Social climate (Collins & Smith, 2006)

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## 2.1 Key supporting theories

### 2.1.1 Resource-based view and dynamic capabilities

Firms are bundles of resources and routines (Penrose & Penrose, 2009). In the resource-based view, firms can achieve sustainable competitive advantages based on their resources that have value, rareness, imperfect imitation, and sustainability (Barney, 1991;

Table 4. Categories of moderators.

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<b>Macro Environment</b>
Environmental dynamism (Gahan et al., 2020)
Industry growth and labor investment (Liu, 2011)
Technical turbulence (Tang et al., 2015)
<b>Organizational Capacity</b>
Knowledge acquisition (Papa et al., 2018)
Knowledge management exploitation practices (Donate & Guadamillas, 2015)
Knowledge transfer and degree of tacit knowledge approach (Li et al., 2019)
<b>Organizational Capital</b>
Human capital (Zhou et al., 2019)
<b>Organizational Climate</b>
Organizational trust (Olander et al., 2015)
Work climate (Chen et al., 2018)
<b>Organizational Culture</b>
Corporate culture (Wei et al., 2011)
<b>Organizational Strategy</b>
Firm entrepreneurship level (Nasution et al., 2011)
Entrepreneur orientation (Tang et al., 2015)
Employee participation, direct voice mechanism, and corporate governance participation (Zhou et al., 2019)
Product market strategy (Chang & Huang, 2005)

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Peteraf, 1993). However, Priem and Butler (2001) express two main concerns for the resource-based view: 1) the resource-based view may have tautological issues in its constructs and faces challenges of testability and validity; and 2) the resource-based view does not address the demand side heterogeneity of resources. With these concerns, researchers began to adapt the dynamic capabilities view of firm activities. This view proposes that how firms react or behave depends on market dynamism. High degrees of dynamic capabilities indicate that some firms are good at addressing market changes and tend to outperform their competitors (Eisenhardt & Martin, 2000; Teece et al., 1997).

The relationships between human resource management systems and firm innovation can be explored with the resource-based view and the dynamic capabilities view. In the static resource-based view, HRM systems can shape, develop, and influence firm human capital—an essential part of innovation—through staffing intelligent job applicants, training current employees with specific skills, and rewarding certain types of performance or behaviors but not others (Donate et al., 2016; Lopez-Cabrales et al., 2009; Stock et al., 2014). In the dynamic capacities view, HRM systems can be used as adjusting mechanisms, which balance market dynamism and the appropriate human capital configuration of the firm (Messersmith & Guthrie, 2010; Wei & Lau, 2010; Zhang et al., 2016) so that firms can maintain or increase their innovation leading to long-term survival (Cefis & Marsili, 2019).

### 2.1.2 Behavioral view of firms and organizational learning theory

The behavioral view of firms and organizational learning theory both belong to evolutionary theory, and both reflect managerial cognition and bounded rationalities of decision makers (Ocasio, 1997). The behavioral theory views firm activities as the result of firm patterns or routines. Therefore, firms tend to satisfice in decisions rather than making optimal decisions. With this view, Nelson and Winter (1982) proposed that innovation can be increased by handling puzzles of prevailing routines or recombining existing routines. Learning theory suggests that, regardless of firm patterns and routines, firms need to balance explorative learning and exploitative learning for long-term business survival and success. To achieve this balance, March (1991) recommended that firms maintain a slow socialization of new members and maintain moderate turnover.

In the behavioral view of firms, HRM systems can be considered as organizational patterns and routines, which play key roles in firm decision-making and business activities. HRM systems influence firm innovation, because firms have historically pursued innovation through attracting, selecting and maintaining highly capable employees (Findikli et al., 2015; Javed et al., 2017; Lau, 2011). In the learning view of firms, HRM systems can enhance innovation, because top-level managers have paid attention to enhance firm human capital through HRM systems. These HRM systems can balance firms' internal and external human capital pools in order to be innovative (Dekoulou & Trivellas, 2014; McGrath, 2001; Shipton et al., 2006).

### 2.1.3 Social exchange theory and motivation theory

Social exchange theory explores interactions among different parties. Cropanzano and Mitchell (2005) identified six different exchange rules (reciprocity, rationality, altruism, group gain, status consistency, and competition) and six types of resources that can be exchanged (love, status, information, money, services, and goods). When studying the interaction between employees and their organizations, researchers have widely applied the reciprocity principle and explored associated variables such as employee job satisfaction, citizenship behaviors, commitment, and engagement (Aryee et al., 2002; Eisenberger et al., 2019; Konovsky & Pugh, 1994; Wang et al., 2019).

Motivation theory explains what people need and explores how to align employees' interests with employers' interests. Motivation theory is rooted in the social exchange between employees and their organizations, because both organizational effects and task characteristics influence employee motivation,

work orientation, and perceived person-organization fit (Howard et al., 2016; Kanfer, 1990; Petri & Govern, 2012; Steers et al., 2004).

In the social exchange perspective, HRM systems can create innovation-supportive or innovation-friendly environments through the reciprocity between an organization and its employees (Boehm et al., 2014; Collins & Smith, 2006; Liu et al., 2017). Moreover, employee engagement, commitment, and citizenship behaviors can improve firm's administrative processes, reduce unnecessary costs, and achieve innovation (Bhatnagar, 2012; Soto-Acosta et al., 2016; Sung & Choi, 2018). In the motivation perspective, HRM systems can influence firm innovation both directly and indirectly. Direct influence can be achieved through promotion, compensation and exit management (Bhatnagar, 2014; Jaw et al., 2010; Wei & Atuahene-Gima, 2009). Indirect influence can be reached through training, communication, and performance appraisals (Chen & Huang, 2009; Jimenez-Jimenez & Sanz-Valle, 2005; Kaya et al., 2010).

### 2.1.4 Strategic human resource management

In the literature of strategic human resource management (SHRM), there are three major theoretical perspectives: the universalistic perspective, the contingency perspective, and the configuration perspective (Delery & Doty, 1996). The universalistic perspective implies that one best HRM system exists across many different situations. The contingency perspective indicates that the best HRM systems are dependent on the context, such as firm strategies and legal environments. Therefore, the best HRM systems are actually the "best fit" HRM systems. The configurational perspective considers HRM systems in a holistic way and explores the synergy and equifinality of HRM practices or components within the HRM systems (Marler, 2012; Martin-Alcazar et al., 2005).

Despite the conceptual differences of SHRM theoretical perspectives, empirically, researchers may apply only one SHRM perspective in any one paper, or they may include, combine and compare these perspectives to study firm innovation in a paper. For example, Zhou et al. (2019) only applied the contingency perspective and examined the mechanism and contextual factors between human resource management practices and employee participation, human capital and firm innovation. Lepak et al. (2007) and Liu (2011) applied both the universalistic perspective and the contingency perspective to explore how human resource management influence firm performance and firm innovation. Delery and Doty (1996) compared three perspectives in their one study and found that different perspectives can contribute to performance differently.

## 2.2 Categories of firm innovation from the human resource management system view

Innovation is a very broad term which includes “production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems” (Crossan & Apaydin, 2010, p. 1155). Camison-Zornoza et al. (2007) suggested that researchers should study innovation as a multidimensional construct rather than a unidimensional construct.

Applying a multidimensional view of firm innovation, I reviewed empirical and theoretical papers about HRM systems and different types of firm innovation in major human resource, management, and business journals, reflected insights from major meta-analysis studies of firm innovation in Table 1, and identified three categories of firm innovation: 1) innovation in people and organization refers to the changes of collective mindsets or beliefs and reflects the innovation orientation and innovation capability in Table 1; 2) innovation in processes refers to changes of organizational or production processes and represents production process innovation, administrative innovation, and technical innovation in Table 1; 3) innovation in products or services refers to updates at endpoints. Table 2 summarizes the different names of firm innovation constructs at different innovation categories in HRM systems studies. The categorization is not only based on the construct names but also the construct measurements.

## 2.3 Empirical and theoretical mediators and moderators

In general, research has found positive relationship between HRM systems and different types of firm innovation. However, these relationships are not consistent in the literature. Unexpected findings motivate researchers to explore potential mediators. For instances, Do et al. (2018) found that the direct relationship between HRM systems and firm innovation was not significant. Relationships were, instead, fully mediated by servant leadership and employee creativity. Boehm et al. (2014) demonstrated that HRM systems do not enhance firm innovation capacities directly. Collective perception of social exchange and diversity climate fully mediated the previous relationships. Unexpected relationships can also be explored by identifying moderators. For example, Wei et al. (2011) found that corporate culture and firm structure jointly moderated the relationship between

HRM systems and product innovation. The relationship was stronger when firms had flat structures and a strong developmental culture. Olander et al. (2015) found that HRM systems were positively associated with firm innovation. However, these relationships were contingent upon organizational trust.

Table 3 provides a list of mediators that researchers have suggested or used to explain how HRM systems influence firm innovation. These mediators can be categorized into the following three types: organizational capacity, organizational capital, and organizational climate. Table 4 shows a list of moderators that researchers identified or applied to explain when HRM systems influence firm innovation. These moderators can be categorized into six categories: macro-environment, organizational capacity, organizational capital, organizational climate, organizational culture, and organizational strategy. Most of these mediators and moderators were applied to innovation in products or services but not to innovation in processes, or innovation in people and organization. It is important to note that organizational capacity, organizational capital, and organizational climate have been used both as mediators and moderators in the literature.

## 3 Future research directions

### 3.1 Apply objective measurements

In the field of human resource management systems and firm innovation, researchers tend to apply subjective measurements of their constructs. For instance, Jimenez-Jimenez and Sanz-Valle (2008) surveyed top executives for their subjective understanding of HRM systems and firm innovation. Similarly, Wei et al. (2011) surveyed HR managers for their subjective rating of HRM systems and surveyed CEOs or financial directors for their subjective opinions about firm innovation performance. Soo et al. (2017) developed their questionnaires of HRM systems and firm innovation based on interviews with top executives and then sent out surveys to middle- and senior-level managers. With this subjective-measurement trend, more and more researchers suggest that future research needs to apply objective measurements of HRM systems and firm innovation (Ceylan, 2013; Do, 2017; Donate & Guadamillas, 2011; Donate et al., 2016; Kang, 2015; Liu et al., 2017; Soto-Acosta et al., 2016; Tang et al., 2015).

Despite the intrinsic difficulties of obtaining objective measures of HRM systems, researchers are making progress. For example, Fu (2015) measured HRM systems based on the data from firms' annual reports. A sample item was “what proportion



of your professional staff are administered an employment test (e.g. skills tests) prior to hiring (229).” The objective measurement of firm innovation can be conducted by asking: 1) revenue from new products and service (Armstrong et al., 2010; Collins & Smith, 2006; Liu, 2011; McGuire, 2003), 2) the number of new products or services (Collins, 2000; Kang, 2015; Messersmith, 2008; Patel et al., 2013), and 3) the percentage of new product (including new goods and services) profits over total profits (Zhou et al., 2019). Future researchers should not only apply objective measures of HRM systems and firm innovation but also explore continuously different ways to measure these constructs objectively. Several potential future research questions can be: 1) Which objective proxies best represent innovation in people and organization at service industries? 2) Will the relationships between HRM systems and different types of firm innovation be different when researchers apply objective proxy measures instead of subjective proxy measures?

### 3.2 Collect data from different people and sources in multiple times

Other than recommending the objective measures of constructs, researchers suggest future 1) collecting data from informants across different levels of an organization (Ceylan, 2013; Fu, 2015; Lopez-Cabrales et al., 2009; Nieves & Osorio, 2017; Olander et al., 2015; Soto-Acosta et al., 2016; Tang et al., 2015), 2) applying longitudinal study designs (Armstrong et al., 2010; Donate & Guadamillas, 2011; Donate et al., 2016; Soto-Acosta et al., 2017; Wang & Chen, 2013; Zhang & Li, 2009), and 3) collecting data from different sources (Donate et al., 2016; Soto-Acosta et al., 2017; Tang et al., 2015; Zhang et al., 2016).

To meet these expectations, future researchers can consider the following approaches: First, researchers can collect subjective data from the same respondents at multiple times (Soo et al., 2017). Second, researchers can collect one-time subjective data from multiple informants (Ceylan, 2013; Ko & Ma, 2019; Lepak et al., 2007; Para-González et al., 2018; Wei et al., 2011). Third, researchers can combine objective measures and subjective measures for testing constructs (Armstrong et al., 2010; Collins, 2000; Collins & Smith, 2006). Fourth, researchers can obtain longitudinal measures of testing constructs from a third-party database (Adebanjo et al., 2020; Kang, 2015; Liu, 2011; Razouk, 2011). Despite intrinsic difficulties, future researchers should strengthen their studies by conducting multi-level analyses with longitudinal data to investigate how time and perceptual differences influence the relationship between HRM systems

and firm innovation. This goal may be achieved by conducting *post-hoc* data analysis. Several potential future research questions can be: 1) What are the perceptual differences between employees and managers about firm innovation and HRM systems? 2) Will the perceptual differences be bigger in service industries than in manufacturing industries?

### 3.3 Conduct studies across different settings

Although firm innovation is widely studied in traditional manufacturing, IT, and the pharmaceutical industry, more and more studies have been conducted outside these industries. For instance, Fu (2015) explored mechanisms explaining how HRM systems influence firm innovation in accounting firms. Gürlek (2020), Nasution et al. (2011), and Nieves and Osorio (2017) investigated how HRM systems influence firm innovation in the hotel industry. Researchers tend to agree on one common future research direction: conduct studies in different settings, such as industries (Chang et al., 2013; Donate & Guadamillas, 2011, 2015; Stock & Zacharias, 2011), countries (Adebanjo et al., 2020; Chang et al., 2019; Kang, 2015; Soto-Acosta et al., 2016), cultural environments (Botelho, 2020; Ceylan, 2013; Chen et al., 2019; Tang et al., 2015), and organizational contexts (Jimenez-Jimenez & Sanz-Valle, 2005; Lopez-Cabrales et al., 2009; Para-González et al., 2018; Wei et al., 2011).

Researchers tend to believe that a large sample with cross-sectional data can enhance the generalizability of study results. However, future researchers need to consider the following questions before their data collection: Why do we collect data in different contexts? What are the contextual factors that explain or differentiate results from one to another? Overall, it is critical for future researchers to align their research interests with their data and fully explain the relationships among theoretical models, study design, and data collection.

Another suggestion for future researchers is that they should specify the data collection plan and the characteristics of the data collected. For example, other than just mentioning that a given study includes data from manufacturing and service industries, future research should describe the fields of manufacturing or services industries their data come from. This specification can help other researchers evaluate the connection of published papers to their own papers or projects. Several potential future research questions can be: 1) What are factors at the organizational level, industrial level, and national culture level that influence the relationships between HRM systems and firm innovation? 2) What are factors that influence how well the innovation-based

HRM systems at headquarter function successfully at subsidiaries?

### 3.4 Explore more contextual and mechanism factors

The research direction “conduct studies across different settings” emphasizes not only the importance of generalizability of human resource management research but also the urgency to explore which and how contextual factors influence the relationship between HRM systems and firm innovation. In addition to exploring contextual factors, future researchers should pay more attention to explaining the mechanisms between human resource management systems and firm innovation (Collins, 2000; Liu et al., 2017; Messersmith, 2008; Patel et al., 2013; Sheehan, 2014; Zhang & Li, 2009).

Based on the information in Table 3 and Table 4, organizational capacity, organizational capital, and organizational climate have been used both as mediators and moderators in the literature. Future researchers may consider exploring these phenomena in the following ways: (1) clarifying the foundational theories that support mediating roles and moderating roles separately; (2) conducting longitudinal studies with objective and subjective measures to explore the empirical justifications of moderation or mediation role of the same construct; and (3) exploring the dynamic synergy among constructs, for instance, with the moderation role of organizational climate, employee human capital mediates the relationship human resource management systems and firm innovation. However, without the effect of organizational climate, employee human capital moderates the relationship between human resource management systems and firm innovation. Moreover, future researchers should investigate other influential moderators and mediators to enhance the explanation power of their studies.

### 3.5 Examine human resource management and firm innovation in a holistic view

The final future research direction I identified is to examine human resource management systems and firm innovation in a holistic view. In the literature, future researchers are recommended to examine different perspectives of human resource management systems (Armstrong et al., 2010; Collins & Smith, 2006; Soo et al., 2017) and different types of firm innovation (Donate et al., 2016; Soto-Acosta et al., 2016; Zhou et al., 2013).

In this paper, I define the human resource management system as including at least three individual human resource practices. Future researchers should

consider and explain why they combine certain types of individual human practices into HRM systems but do not include other individual human resource practices. In the literature, human resource management systems have various names, such as “high performance work systems” (Messersmith & Guthrie, 2010; Patel et al., 2013; Wang & Chen, 2013), “high involvement human resource management systems” (Chow & Liu, 2009; Lepak et al., 2007; Wright et al., 1998), “collaborative human resource systems” (Lopez-Cabrales et al., 2009; Nieves et al., 2016; Soo et al., 2017), “commitment-based human resource systems” (Ceylan, 2013; Collins & Kehoe, 2017; Collins & Smith, 2006). Future researchers should also work on strengthening the connections between the measurements and different types of human resource management systems.

Regarding firm innovation, future researchers should not only refine measures and collect objective data but also integrate multiple perspectives of firm innovation. In this way, future researchers can examine the interrelationships between firm innovation and other firm outcomes, such as firm financial performance and stock price. In a broad perspective, future researchers are encouraged to apply theories across disciplines to enhance our current understandings of firm innovation.

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