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# Improving innovation performance through knowledge acquisition: the moderating role of employee retention and human resource management practices

Armando Papa, Luca Dezi, Gian Luca Gregori, Jens Mueller and Nicola Miglietta

## Abstract

**Purpose** – This paper aims to study the effects of knowledge acquisition on innovation performance and the moderating effects of human resource management (HRM), in terms of employee retention and HRM practices, on the above-mentioned relationship.

**Design/methodology/approach** – A sample of 129 firms operating in a wide array of sectors has been used to gather data through a standardized questionnaire for testing the hypotheses through ordinary least squares (OLS) regression models.

**Findings** – The results indicate that knowledge acquisition positively affects innovation performance and that HRM moderates the relationship between knowledge acquisition and innovation performance.

**Originality/value** – With the increasing proclivity towards engaging in open innovation, firms are likely to face some tensions and opportunities leading to a shift in the management of human resources. This starts from the assumption that the knowledge base of the firm resides in the people who work for the firm and that some HRM factors can influence innovation within firms. Despite this, there is a lack of research investigating the link between knowledge acquisition, HRM and innovation performance under the open innovation lens. This paper intends to fill this gap and nurture future research by assessing whether knowledge acquisition influences innovation performance and whether HRM moderates such a relationship.

**Keywords** HRM, Knowledge acquisition, Innovation performance, Open innovation, Employees retention

**Paper type** Research paper

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## 1. Introduction

Early studies in the business management field suggest that knowledge is the most important resource for firms to compete and create unique advantages (Nonaka, 1994; Grant, 1996). So far, there has been an arduous debate on whether firms create knowledge internally or acquire it externally. Either way, firms have to create knowledge and leverage dispersed knowledge to increase competitiveness (Von Krogh, 1998; Argote and Ingram, 2000; Alavi and Leidner, 2001), to respond to changes of the competitive and technological environment (Dezi, 1996a; Teece, 2007). Consequently, firms increasingly have to heighten their internal knowledge management capacity to manage inward and outward flows of knowledge – thereby, exploiting and exploring external opportunities (Lichtenthaler and Lichtenthaler, 2009). These trends are led by the increasing globalization and changes in the social, economic and technological environment, which calls for new, dynamic and participative approaches to innovation (Siggelkow, 2001; Bresciani *et al.*, 2016).

According to the open innovation paradigm, firms can and should acquire dispersed knowledge from external actors to integrate with knowledge developed internally and

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possessed by firm employees (Chesbrough, 2003). Most importantly, people inside the organization are called to search for external knowledge and integrate it with the internal knowledge to improve processes and products (West and Bogers, 2014). Moreover, the innovation culture is spread among employees as a key intangible resource that moves action towards creativity and shared beliefs (Barney, 1986; Vrontis *et al.*, 2016a). For these reasons, it is reasonable to infer that human resource management (HRM) – namely all the decisions made by the management of a firm that affect the relationship between the firm and its employees (Beer, 1984) – could affect the capacity of acquiring and managing knowledge properly. This could stimulate an “open” innovation culture within firms. In fact, studies within the HRM domain found that certain practices foster knowledge management and innovation processes (Ichniowski *et al.*, 1997; Laursen and Foss, 2003; Michie and Sheehan, 2003; Darroch, 2005; du Chatenier *et al.*, 2007, 2010). In addition to this, acquiring or sourcing external knowledge may provoke many internal tensions, requiring cultural and HRM efforts and practices. Despite this, there has been scarce interest in the intra-organizational aspects of open innovation so far (van de Vrande *et al.*, 2010; Petroni *et al.*, 2012; Chesbrough *et al.*, 2014; Bogers *et al.*, 2017a, 2017b), and on internal factors and antecedents that help in the pursuit of knowledge acquisition and open innovation strategies (Van Beveren, 2002).

Therefore, this paper aims to contribute to leading literature addressing the research gap aforementioned by shedding more light on the issue concerning the human aspect of open innovation. In particular, it investigates whether knowledge acquisition (one the main aspects of the open innovation paradigm) leads to higher levels of innovation performance through higher levels of HRM. Regarding HRM – which represents a valuable contribution of this paper – the empirical analysis focuses on employee retention and HRM practices. First, from a resource-based view perspective, talents and knowledge workers are intangible resources that are essential to achieving competitive advantage; these workers are driven by commitment (Muffatto, 1998; Michie and Sheehan, 2003), which is a prerequisite for innovation culture. Second, evidence exists that HRM practices foster knowledge sharing and innovativeness (Lazzarotti *et al.*, 2015), and, thus, we hypothesized that it also fosters the knowledge acquisition process.

To reach the goal of this paper, this research applied a quantitative methodology involving OLS regression analyses to test several hypotheses (developed under the open innovation and HRM lens) on a sample of Italian firms operating in a wide array of sectors. Findings indicated that knowledge acquisition has a positive and significant effect on innovation performance and, most importantly, employee retention and HRM practices moderate the above relationship.

The remainder of the paper is organized as follows: Section 2 proposes the theoretical backbone of the paper regarding open innovation and knowledge acquisition. Also, Section 2 develops hypotheses relating to the moderating effect of employee retention and HRM practices on the relationship between knowledge acquisition and innovation performance. Section 3 explains the methodology of this study while Section 4 presents the OLS regression test of the hypotheses and the related results. Section 5 presents a concluding discussion identifying managerial implications and issues for upcoming research.

## 2. Theoretical background and hypotheses

### 2.1 Knowledge acquisition and innovation performance

The value creation for a firm depends on intangible and knowledge-based resources (Grant, 1996; Wiklund and Shepherd, 2003), which can be acquired externally or developed internally by employees and R&D departments (Scuotto *et al.*, 2017a). However, an integrative perspective which considers both internal and external sources of knowledge

is relatively new in management studies (Dezi, 1996b; Grant and Baden-Fuller, 2004; Chesbrough, 2006; Teece, 2007; Del Giudice and Maggioni, 2014; Scuotto *et al.*, 2017b).

From a dynamic capabilities perspective, Teece (2007) claims that firms could combine internal and external knowledge to cope with the dynamic environment and to exploit technological and commercial opportunities. The open innovation theory describes this combination suggesting that “[...] firms can and should use external as well as internal ideas, and internal and external paths to market, as they look to advance their technology” (Chesbrough, 2004, p. 1). The inbound open innovation mechanism describes the acquisition of external knowledge or technologies through practices such as licensing-in or participating in communities, while the outbound open innovation mechanism explains the transferring of internal knowledge or technologies to external actors for economic or strategic purposes (Cheng and Shiu, 2015; Lichtenthaler, 2015).

Thus, the open innovation model suggests new forms of interactions and collaborations that foster innovativeness within firms (Bonfanti *et al.*, 2015; Della Peruta *et al.*, 2016). These forms of collaboration can be established as formal or informal (West and Lakhani, 2008; Baraldi *et al.*, 2011), through pecuniary or non-pecuniary mechanisms (Dahlander and Gann, 2010), and can involve knowledge from market-based sources or science-based sources (Chen *et al.*, 2016; Del Giudice *et al.*, 2013). The openness degree of the innovation process is explained through the number of external sources of knowledge involved and the depth of each external relationship (Laursen and Salter, 2006).

Therefore, firms develop competitive advantages through knowledge exploitation and exploration both within and outside the firm's boundaries (Campanella *et al.*, 2017; Vrontis *et al.*, 2017). On one hand, internal departments and employees are pushed to find new solutions and develop new products to meet customers' needs (Vrontis *et al.*, 2016b). On the other hand, internal departments and employees struggle to find knowledge that is externally provided by the customers through not only customer engagement techniques, from other market-based sources such as suppliers and distributors, but also from scientific partners such as universities (Fabrizio, 2007; Tardivo *et al.*, 2017).

Several studies suggest that – although no firm can be considered totally open – some firms tend to establish more external relationships, while others concentrate their efforts with one or two intense ties (Laursen and Salter, 2006; Naqshbandi and Naqshbandi, 2016). Therefore, despite the fact that little attention has been given to the link between open innovation and strategy, the openness degree seems to be a strategic priority for innovating firms. These management decisions about openness are essential for achieving competitive advantage (Del Giudice and Maggioni, 2014).

With particular regard to knowledge acquisition (inbound open innovation), the breadth of external sources of knowledge is associated with positive innovation performance in literature. This helps firms develop new combinations of knowledge that are useful for being innovative (Katila and Ahuja, 2002; Leiponen and Helfat, 2011), enriching the pool of solutions available to solve innovation challenges endemic to the firm (Dahlander *et al.*, 2016). Moreover, firms that pursue widely and extensively inbound open innovation are more likely to obtain more knowledge and technologies capabilities (Santoro *et al.*, 2017b).

Therefore, we posit that:

*H1. Knowledge acquisition is positively related to innovation performance*

## **2.2 Human resource management and knowledge acquisition**

Apart from the level of openness to innovation, employees cover an important role in recognizing and integrating sources of knowledge within the innovation process (West and Bogers, 2014) and manage knowledge strategically (López-Nicolás and Meroño-Cerdán, 2011). Despite this, there have been few attempts to describe the human and intra-

organizational aspects of open innovation in literature. This is striking, given that acquiring or sourcing external knowledge may provoke many internal tensions requiring cultural and HRM efforts and practices (Chesbrough *et al.*, 2014). In fact, open approaches to innovation involve tensions, complex and risky outcomes (de Araújo Burcharth *et al.*, 2014; Del Giudice and Della Peruta, 2016). Previous studies tried to suggest knowledge management and organizational capacities essential in managing such a complexity (Cohen and Levinthal, 1990; Ahn *et al.*, 2016; Ferraris *et al.*, 2017b; Santoro *et al.*, 2017a). Despite this, the issue has not been explained from a HRM perspective.

HRM controls all decisions made by the management of a firm which then affect the relationship between the firm and its employees (Beer, 1984). Literature usually distinguishes a number of relevant areas of policies and practices within the broad field of HRM. In particular, HRM controls (De Leede and Looise, 2005):

1. the design of organizations and tasks;
2. the staffing of the organization by managing the in-, through- and out-flow of personnel;
3. the measurement of performance and the reward of employees; and
4. the channels for communication and participation in work and decision-making.

According to an early view, the HRM priority should be the creation of a safe environment that aligns the organizational strategy and climate to the values of the employees via motivation, incentives and education. The organizational strategy would also be aligned to the empowerment of the human side of the enterprise that would foster organizational development and improve organizational culture (McGregor, 1960). Therefore, from an organizational perspective, this means that the management of people within the organization must be an essential element of the firm's ability to reach and realize its goals (Yahya and Goh, 2002; Salampasis *et al.*, 2015).

To date, there has been an increasing interest in understanding the strategic role of HRM and the benefit for the firm and innovation performance. Accordingly, there is evidence of positive effects of recruitment and selection, training, human resources (HR) planning, rewards system and employee participation activities on higher productivity (Koch and McGrath, 1996; Lazear, 1996); market performance (Delaney and Huselid, 1996; Hartog and Verburg, 2004), overall performance (Pfeffer, 1998; Fey *et al.*, 2000) and innovativeness (Hoque, 1999; Andries and Czarnitzki, 2014).

Nevertheless, few studies investigated how HRM contributes to knowledge management and to acquiring and integrating external knowledge through inbound open innovation. Therefore, the link between knowledge acquisition and HRM remains unexplored in literature. However, some studies suggest that firm's innovation culture, its HRM and employees' characteristics influence the adoption of open innovation strategies and help in pursuing them effectively (Harison and Koski, 2010; Salampasis *et al.*, 2015; Bogers *et al.*, 2017).

A first important question in the management of HR for open innovation regards talents (Chesbrough, 2003). This means that firms strive to find, recruit and retain best talents and knowledge workers (Murray *et al.*, 2016). This is hard to achieve; thus, firms sometimes acquire knowledge possessed by talent involved in other firms.

Accordingly, global talent management is about systematically utilizing HRM activities to attract, develop and retain individuals with high levels of human capital (e.g. competency, personality, motivation) consistent with the strategic directions of the firm in a dynamic, highly competitive and global environment (Tarique and Schuler, 2010). The hypothesis in this paper is that the ability for recognizing useful external knowledge resides in the employees' capabilities and talent (Lewis and Heckman, 2006), given that talent plays a key role in the relationships a firm has with its external stakeholders (Zhang *et al.*, 2015).

Therefore, employee retention is reasonably expected to be positively associated with commitment and trust with the firm, and it is also likely to foster knowledge specialization and fortification (Muffatto, 1998; Politis, 2003). In fact, short-term contracts and low level of commitment have been found counterproductive to the firm's innovativeness (Michie and Sheehan, 2003). Along with this, knowledge acquisition strategies potentially lead to higher levels of professional commitment of employees (Bogers *et al.*, 2017). Commitment may create a positive social climate that encourages employees to act in line with the firm's objectives by being enablers of a positive social climate to stimulate innovation (Soto-Acosta *et al.*, 2017; Popa *et al.*, 2017).

It is thus reasonable to infer that, through a higher level of commitment and retention, employees are more willing to consider the open innovation strategy and approach of the firm, understanding the need to integrate the knowledge developed internally and externally. Moreover, with the retention of the employees, the knowledge base of the firm increases and, as employee retention is important to acquire and integrate knowledge, the firm augments the likelihood of benefiting from knowledge acquisition. (Weber and Tarba, 2010). As a consequence, with a higher level of an internal knowledge base, firms develop a higher level of absorptive capacity useful to recognize, acquire, absorb and integrate external knowledge acquired (Cohen and Levinthal, 1990; Wang and Han, 2011).

Therefore, the paper posits that:

*H2.* The higher the employee retention, the higher the effects of knowledge acquisition on innovation performance

Linked to the above hypotheses, HRM practices, such as training and learning, proper recruitment and selection, have been found positively associated with knowledge creation and innovation in literature (Laurson and Foss, 2003; Michie and Sheehan, 2003; Chand, 2010). Moreover, with reward systems these benefits are even stronger because employees feel incentivized to work better (Ichniowski *et al.*, 1997). Job satisfaction and commitment stimulate employees to be creative, involved in the values of the firm, and contribute to building an innovation culture (Zhou *et al.*, 2005). In this way, firms build a higher level of trust, social capital and group identity (Agarwal *et al.*, 2010).

In general, appropriate roles, structures, procedures and systems are also relevant to enable effective knowledge flows when innovation is carried out in collaboration (Petroni *et al.*, 2012). Other scholars have highlighted the crucial role of human and organizational capital and related HRM practices in creating a context that favours knowledge management within the firm (Cabrera and Cabrera, 2005; Yang and Lin, 2009). Lazzarotti and others (2015) suggest that firms should carefully manage several HRM practices, such as selection and recruiting of personnel, training, development and reward system to promote knowledge transfer and innovativeness.

As stated in the previous paragraph, an open approach to innovation involves the engagement between two actors through formal or informal ties (West and Lakhani, 2008). This means that, at the organizational level, HRM practices such as team work are essential in managing inter-organizational innovation processes. In particular, these are essential for:

1. the management of collaboration processes;
2. the management of the whole innovation process;
3. the creation of knowledge in a collaborative manner; and
4. the importance of boundary-spanning, novelty-generating, negotiating and learning competences for employees (du Chatenier *et al.*, 2007, 2010).

Literature also recognizes that greater degrees of openness imply increasing organizational and managerial complexity (Bader and Enkel, 2014) and certain HRM practices can help in



managing such complexity. From a social capital perspective, HRM systems may foster social relations among employees by improving their opportunity, motivation and ability to access and mobilize; that, in turn, may extend to collaborative ties externally (Adler and Kwon, 2002), which would be useful to acquiring knowledge .

For these reasons, the paper hypothesizes that:

- H3.* The higher the use of HRM practices, the higher the effects of knowledge acquisition on innovation performance (Figure 1).

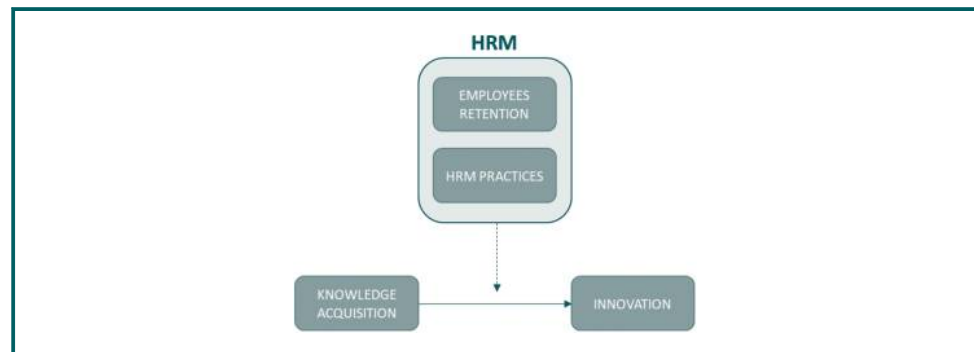
### 3. Methodology

#### 3.1 Research sample and design

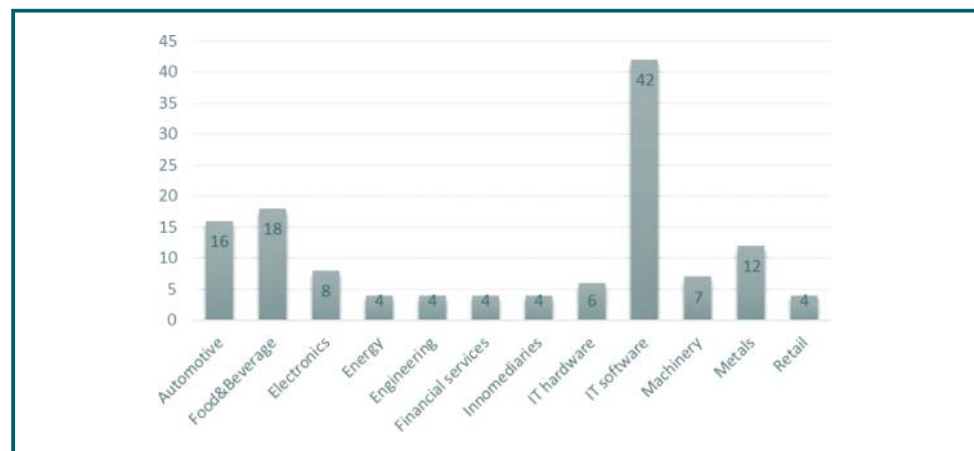
The paper aims to study the effects knowledge acquisition on innovation performance and the moderating effect of HRM, in terms of HRM practices and employee retention, on the abovementioned relationship. To do so, the research used a quantitative methodology involving a sample of Italian firms operating in different sectors. In detail, firms within the sample belong to a wide array of manufacturing and service industries such as ICT, food and beverage, textile and automotive (Figure 2).

The research is based on a survey methodology, which is useful to enhance the generalization of results (Dooley, 2001). As a first step, a conceptual model for developing hypotheses was proposed in the previous section. Then, the quantitative study aimed at

**Figure 1** The conceptual model



**Figure 2** Sectors



testing the hypotheses developed. To reach this goal, a total of 1200 firms of different sizes with at least 20 employees were randomly selected from the Italian database *AIDA – Bureau van Dijk*. This criterion has been established because with fewer employees, the HRM can be less frequent or unnecessary. Second, an email with an invitation to participate in the survey, along with a letter containing an explanation of the study's purpose was sent to all the firms. In total, 192 firms expressed interest in entering the study. Third, a questionnaire, composed of several questions (open and closed), was sent to these firms; this was answered and returned by 129 firms.

The questionnaire was developed according to the previously discussed literature and sent with a brief introduction explaining the scope of the research. It was divided in two parts, with both open and closed questions. The first part investigated general information about the firm, such as industry, number of employees, age and innovative, financial and economic performance. The second part investigated specific approaches to innovation, knowledge acquisition, HRM practices and employee retention.

The single questions were separated to reduce the risk of rationalizing the answers of the respondents. Moreover, dependent and independent variables were placed in different positions within the questionnaire to limit potential common method variance.

We also assessed potential non-response bias by looking for differences between early and late respondents (Kanuk and Berenson, 1975). To do so, the order of responses to the survey was recorded and it was revealed to be non-significantly correlated with both firm age and firm size; this suggested that concern regarding non response bias is minimal (Hawes and Crittenden, 1984). We also found no substantial differences in either firm age or firm size across industries. Data were processed through an OLS regression model, following previous studies (Lichtenthaler, 2009; Parida *et al.*, 2012).

### 3.2 Variables

With regard to innovation as a performance measure, it processes the ability of a firm of developing new products or services (Laursen and Salter, 2006). In particular, it is taken from previous studies in innovation management, and is calculated by using the percentage of sales from new or significantly improved products and services on total sales of the firm (Laursen and Salter, 2006; Brunswicker and Vanhaverbeke, 2015; Chen *et al.*, 2016).

The independent variable is *knowledge acquisition*. To measure it, we used the concept of search breadth, developed by Laursen and Salter (2006), by asking subjects to indicate how many external sources of knowledge are exploited to innovate on a total of 16 sources. As a result, a score of 0 indicates a closed innovation approach, while a score of 16 indicates a totally open approach to knowledge acquisition. The list of the external sources of knowledge is provided in Table I.

The moderating variables, employee retention and HRM practices, were developed using multi-item scales, according to relevant literature, to ensure their validity. Table II shows the specific questions and items for each variable. In particular, we asked the respondent to evaluate several statements with a seven-point Likert scale.

Finally, we assessed internal consistency of each variable measured through multi-item (Cronbach's  $\alpha$  employees' retention = 0.764; Cronbach's  $\alpha$  HRM practices = 0.841), which showed good results. Therefore, the average values of the items could be used to develop the main variable.

Finally, several control variables were included in the models. First, the size of the firm can affect the digital resources possessed and knowledge creation processes (Dewar and Dutton, 1986). The number of employees represents the firm size. Second, the age of the firm, namely the number of years since founding, is included in the models (Huergo and Jaumandreu, 2004). Third, we controlled for R&D intensity, calculated as the share of



**Table I** External knowledge sources

Type	Knowledge sources
Market	Suppliers of equipment, materials, components and software
Market	Clients or customers
Market	Competitors
Market	Consultants
Market	Commercial laboratories/R&D enterprises
Institutional	Universities or other higher education institutes
Institutional	Government research organizations
Institutional	Other public sector
Institutional	Private research institutes
Other	Professional conferences and meetings
Other	Trade associations
Other	Technical/trade press and computer databases
Other	Fairs and exhibitions
Specialized	Technical standards
Specialized	Health and safety standards and regulations
Specialized	Environmental standards and regulations

Source: Adapted from [Laursen and Salter \(2006, p. 139\)](#)

**Table II** Variables and items

Variables	Questions	Related literature
<i>Employees' retention</i>	The importance of retaining employees in the top management	<a href="#">Ranft and Lord (2000)</a>
	The importance of retaining employees in the middle management	<a href="#">Ranft and Lord (2000)</a>
	The importance of retaining employees in manufacturing and operations	<a href="#">Ranft and Lord (2000)</a>
	The importance of retaining employees in R&D	<a href="#">Ranft and Lord (2000)</a>
	The importance of retaining employees in finance, legal and other staff	<a href="#">Ranft and Lord (2000)</a>
	The importance of performance related rewards	<a href="#">Chand (2010)</a>
<i>HRM practices</i>	The importance of flexible work	<a href="#">Chand (2010)</a>
	The importance of training and learning	<a href="#">Chand (2010)</a>
	The importance of recruitment and selection	<a href="#">Chand (2010)</a>

investments in R&D to total revenues for the year, given that it could affect knowledge creation and innovation within firms ([Cohen and Levinthal, 1990](#); [Bresciani et al., 2015](#); [Santoro et al., 2016](#)).

#### 4. Procedures and results

Descriptive statistics show that firms of the sample on average are small and medium enterprises (the average number of employees is 98.90), even though some larger firms are included in the sample, spend 10.038 per cent of total sales in R&D and they are rather innovative (32.78 per cent of the revenues comes from new products and services) ([Table III](#)).

The hypotheses have been tested using OLS regression analysis and the results are presented in [Table IV](#). Model 1 has an  $R^2$  of 0.279 (the adjusted  $R^2$  is 0.248) and an  $F$ -value of 8.989 ( $p < 0.001$ ). Model 2 has an  $R^2$  of 0.322 (the adjusted  $R^2$  is 0.287) and an  $F$ -value of 9.108 ( $p < 0.001$ ). Model 3 has an  $R^2$  of 0.311 (the adjusted  $R^2$  is 0.275) and an  $F$ -value of 8.667 ( $p < 0.001$ ) ([Table V](#)).

In detail, Model 1 tests the effect of knowledge acquisition on innovation performance, which is positive and significant, confirming *H1*. Model 2 tests the moderating effect of

**Table III** Descriptive statistics

Statistics variables	N	Minimum	Maximum	Mean	Standard dev.
R&D	129	0.000	0.480	0.10038	0.126512
Size	129	20.00	1,728.00	98.90	252.502
Age	129	5.00	95.00	25.61	24.117
Innovation	129	0.00	1.00	0.3278	0.24133
KA	129	3.00	16.00	8.70	3.046
HRM	129	2.50	7.00	5.2558	1.27033
ER	129	1.00	7.00	4.9674	1.46368

Notes: HRM: HRM practices; ER: employee retention; KA: knowledge acquisition

**Table IV** Correlation matrix

Statistics variables	R&D	Logsize	Logage	Innovation	KA	HRM	ER
R&D	1	0.012	0.178	-0.046	0.317**	0.014	0.281**
Logsize	0.012	1	0.418**	0.012	0.144	-0.135	0.071
Logage	0.178	0.418**	1	-0.438**	0.422**	-0.160	0.173
Innovation	-0.046	0.012	-0.438**	1	0.343**	0.047	0.104
KA	0.317**	0.144	0.422**	0.343**	1	0.066	0.061
HRM	0.014	-0.135	-0.160	0.047	0.066	1	0.139
ER	0.281**	0.071	0.173	0.104	0.061	0.139	1

Notes: \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ ; HRM: HRM practices; ER: employee retention; KA: knowledge acquisition

**Table V** Results of regressions[TQ3]

Variables	Model 1	Model 2	Model 3
R&D	-0.041 (-0.493)	-0.162 (-1.626)	-0.112 (-1.242)
Logsize	0.229 (2.625)*	0.218 (2.550)*	0.193 (2.219)*
Logage	-0.569 (-6.346)***	-0.433 (-4.362)***	-0.442 (-4.300)***
HRM			0.619 (2.604)*
ER		0.264 (0.927)*	
KA	0.218 (2.582)*	0.241 (0.851)*	0.660 (1.829)*
KA*HRM			0.853 (2.982)**
KA*ER		0.345 (1.026)**	
R	0.528	0.568	0.558
R <sup>2</sup>	0.279	0.322	0.311
Adjusted R <sup>2</sup>	0.248	0.287	0.275
F-value	8.989***	9.108***	8.667***

Notes: \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ ; T-values in parentheses; KA: knowledge acquisition; HRM: HRM practices; ER: employee retention

employee retention on the relationship between knowledge acquisition and innovation performance, which is positive and significant ( $B = 0.345$ ;  $T = 1.026$ ;  $p < 0.01$ ), confirming  $H2$ . Model 3 tests the moderating effect of HRM practices on the relationship between knowledge acquisition and innovation performance, which is positive and significant ( $B = 0.853$ ;  $T = 2.982$ ;  $p < 0.01$ ), confirming  $H3$ . Another remarkable result indicates that the moderating effect of HRM practices is stronger than the one of employee retention.

The models also indicate that size and age have a significant effect as control variables. In detail, size affects innovation positively, as shown in Models 1, 2 and 3, while age affects innovation negatively. Finally, R&D intensity does not have a significant effect on innovation performance.

## 5. Discussion and conclusions

The paper aims to study the effects of knowledge acquisition on innovation performance and the moderating effect of HRM – in terms of HRM practices and employee retention – on the abovementioned relationship. Developing a conceptual model based on knowledge acquisition and HRM literature, three hypotheses have been developed and tested through OLS regression analysis on a sample of 129 firms.

In particular, a baseline hypothesis was first proposed about the positive effect of knowledge acquisition on innovation performance. Then, it was hypothesized that employee retention and HRM practices moderate the relationship between knowledge acquisition and innovation performance. Results strongly supported the three hypotheses proposed. From one side, HRM practices develop a trustful and powerful organizational climate and flexibility, which can influence the flexibility – namely, how employees feel free to innovate and share ideas and visions. Moreover, through HRM practices a firm improves the level of commitment and understanding of the firm's mission and values (Goleman, 2000). In this way, employees are more willing to include external knowledge and avoid the Not-Invented-Here Syndrome (Gupta and Singhal, 1993).

From the other side, our findings suggest that employee retention improves the effect of knowledge acquisition on innovation performance. One possible explanation is that employee retention increases commitment and trust among employees, fostering knowledge specialization and fortification (Muffatto, 1998; Michie and Sheehan, 2003) and innovation culture (Soto-Acosta *et al.*, 2017; Popa *et al.*, 2017). Moreover, according to the absorptive capacity theory, with the retention of the employees, the knowledge base of the firm increases, and, therefore, the firm augments the likelihood of benefiting from knowledge acquisition (Cohen and Levinthal, 1990). As a consequence, with higher levels of an internal knowledge base, firms develop higher levels of absorptive capacity which is useful to recognize, acquire, absorb and integrate external knowledge provided through knowledge acquisition (Ferrerías-Méndez *et al.*, 2015; Ferrerías-Méndez *et al.*, 2016; Ferraris *et al.*, 2017a).

These research findings drive us to develop several implications to theory. First, our research contributes to theory indicating that the HRM aspect of open innovation, with particular regard to knowledge acquisition. This is important for firms, given that knowledge is the most important resource for innovation within firms, and innovation is driven by the knowledge possessed by the firm's employees. In this regard, acquiring or sourcing external knowledge may provoke many internal tensions requiring cultural and HRM efforts and practices. Despite this, there has been scarce interest in the intra-organizational aspects of open innovation so far (Van De Vrande *et al.*, 2010; Petroni *et al.*, 2012; Chesbrough *et al.*, 2014; Bogers *et al.*, 2017). Therefore, the paper suggests that some HRM activities have to be established before structuring knowledge acquisition activities.

Second, by drawing on HRM literature, our research proposed several elements important in the knowledge management possessed by firms. Accordingly, the moderating effect of employee retention and HRM practices on the relationship between knowledge acquisition and innovation performance have been tested. In particular, HRM practices such as performance-related rewards, flexible work, training and learning and recruitment and selection, are important to foster knowledge acquisition and, in turn, innovation performance. Therefore, with certain HRM activities, firms are more able to develop innovative products and services as suggested by literature (Hoque, 1999; Andries and Czarnitzki, 2014). In turn, employee retention is important in sustaining knowledge acquisition and innovation (Michie and Sheehan, 2003). One possible explanation recognizes the relevance of knowledge useful to innovate possessed by employees who cultivate internal capabilities useful to exploit external knowledge and opportunities.

Our study also has practical implications. First, the management of the firms should adopt a HRM strategic view when approaching knowledge acquisition. This underlines the importance

of employee and human aspects in managing internal and external sources of knowledge as antecedents of innovation. In particular, HR managers must promote initiatives to stimulate a collaborative approach to innovation, along with specific practices that can be useful to improve innovation. In the specific case of our paper, rewards based on performance, flexibility in workday training and learning activities and recruitment and selection are seen as important elements to foster knowledge acquisition and innovation. At a firm level, seeking external knowledge extensively and from heterogeneous sources leads to many opportunities but also leads to a higher level of complexity. Firms can manage the allocation of attention between internal and external search sources by cultivating a portfolio of different initiatives linked to HRM. This is even more evident in dynamic and turbulent sectors, which call for flexibility, external ideas and technologies and, therefore, a higher focus on HRM.

The results of our work should be considered in light of several limitations. First of all, data were gathered from top managers of the firms involved in the research and, therefore, they can be influenced from subjectivity. A second limitation is related to the context of analysis (Italy), which may suffer from specific and systemic conditions affecting the HRM practices within the firms – especially if we are neglecting the persistence of a family ownership. Thirdly, we cannot forget the limitations due to the specificity of the empirical analysis through OLS that surely affect the reliability of the data. Future studies can address the human aspect of open innovation for analysing the perspective of the employees' involvement in the management of knowledge and in collaborative activities. Finally, our research focussed on firms from a specific country and operating in heterogeneous sectors; therefore, results in different geographical and cultural contexts can be different. In addition, future studies could address the issue proposed in this paper in specific sectors.

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