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Why do firms seek to share human resource management knowledge? The importance of inter-firm networks[☆]

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ABSTRACT

This study untangles the social processes and inter-firm mechanisms underlying human resource management (HRM) knowledge networks. The research questions serve to advance understanding of why HRM knowledge flows between firms under contractual relationships and in the absence of formal relationships. The study analyzes data from a complete network of 51 high-technology firms located in a science and technology park to report the structural properties and relational dimensions of inter-firm flow of HRM knowledge. The results from this social network analysis show that the firms in the study actively engage in the sharing of HRM knowledge. Specifically, the results not only indicate the preeminence of formal ties but also of relational factors relating to firm legitimacy, prestige, and collaborative interaction. Participation in inter-firm knowledge networks appears to be an effective tool for obtaining HRM knowledge as well as for enhancing legitimacy and prestige between firms and developing trust and reciprocity within collaborative relationships.

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1. Introduction

In order to succeed, firms not only need to channel resources into developing or refining ways of managing their employees but also need to learn from each other, acquiring other firms' best practices in managing people and adapting those best practices to their specific organizational requirements (Kang, Morris, & Snell, 2007). Building up knowledge of how to manage employees is a critical source of competitive advantage for firms (Grant, 1996). Indeed, previous research on human resource management (HRM) shows that firms that manage their employees according to a specific set of HR policies and practices obtain higher financial returns and long-term economic benefits that guarantee superior organizational performance (Huselid, Jackson, & Schuler, 1997). Despite the appeal of this argument, scholars engaged in HRM research focus primarily on HRM decisions at the intra-organizational level and

on the idea that HR practices must fit in with organizational strategy in order to produce performance enhancements (Delery & Doty, 1996). Research incorporating HRM into inter-firm relationships (Brass, 1995; Kinnie, Swart, & Purcell, 2005; Mirvis, 1997) is less substantive.

Although this notion may provide valuable insights into explaining flows of HRM knowledge, scholars in the HRM field have only recently begun to explore the external contextual and relational factors that potentially influence HRM decisions (Paauwe & Boselie, 2005; Subramony, 2006). Until now, the literature has lacked empirical evidence of the socially embedded nature of inter-firm HRM knowledge exchange and how these flows of HRM knowledge are translated into higher-level outcomes. Such outcomes are potential sources of competitive advantage, via organizational learning and organizational innovation (Paauwe & Boselie, 2005).

Additional work is necessary to empirically explain the notion of HRM knowledge flow and the context in which such knowledge is exchanged among inter-firm relationships. Knowledge of HRM is not static; the exposure of firms to the experience of others in acquiring and developing organizational capabilities, and how they learn from it, increases their executives' knowledge. Thus, the need for further research on HRM knowledge sharing is all the more evident. For example, popular management books and articles offer firms and individual HR managers information about effective practices that reportedly work well in other companies (Abrahamson & Fairchild, 1999; Mazza & Alvarez, 2000; Rynes, Giluk, & Brown, 2007). There is also certain evidence of the role of professional service firms in the diffusion and legitimation of HRM knowledge (Kimberly, 1981). Interestingly, while the role of HRM in

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fostering intrafirm and inter-firm knowledge flows has been the subject of organizational research (Legnick-Hall & Legnick-Hall, 2003), less is known about the dynamics involving exchange of HRM knowledge across organizations (Kossek, 1987; Morishima, 1995).

The absence of a body of research on the inter-firm flow of HRM knowledge may largely be due to the theoretical principles that for the most part govern the field of HRM. One such theory is the resource-based view (RBV) of the firm, which influences the field of strategic HRM. The RBV shifts emphasis away from external factors (such as industry position) toward internal firm resources (such as a firm's human resources) as sources of competitive advantage. As a result of its internal focus, the RBV may fail to generate research on inter-firm HRM knowledge sharing. This study takes a step towards integrating literature on RBV and HRM, along with the literature on the influence of social networks in inter-firm relationships.

The objective of this paper is to empirically analyze the strategic and relational factors that determine a firm's intention to participate in HRM knowledge networks: Why do individual firms actively participate in sharing HRM knowledge? And, in particular, how are these players identified and influenced? According to the literature on inter-firm knowledge sharing, several factors determine the level of embeddedness of partners in their networks. With regard to the current study, the focus is on the factors that some authors report as having a greater impact on knowledge sharing: partnership, credibility, strength of collaborative interaction, and perceived utility (Easterby-Smith, Lyles, & Tsang, 2008; Parmigiani & Rivera-Santos, 2011). I then adopt the social network perspective to analyze empirically how these factors favor inter-firm HRM knowledge sharing. This analysis is especially relevant for the successful management of knowledge flows, particularly with respect to the levels of collaboration that are required for independent firms to actually exchange HRM knowledge with each other.

The organization of this paper is as follows. The first section discusses the conceptual background for inter-firm knowledge networks and provides the analytical framework to be tested in this study. Next is an explanation of the social network research methods, followed by a report detailing the setting in which data on inter-firm knowledge were collected. The results section tests hypotheses regarding the reasons for firms to form inter-organizational networks in order to exchange HRM knowledge. High-tech firms located in a science and technology park managed by a public university provided complete network data. This data set the stage for general observations on the HRM knowledge sharing dynamics between firms and the relational reasons for such exchange. The final section provides concluding remarks and lines of future inquiry.

2. HRM knowledge sharing in inter-firm relations

The changing economic and market environment compels organizations to establish complex relationships with other firms. In this web of relationships, the generation, acquisition, transfer, and exchange of knowledge is one of the most crucial resources for firms (Grant, 1996; Nonaka, von Krogh, & Voelpel, 2006). Recently, scholars have begun to investigate aspects of knowledge sharing in inter-firm networks, defined as voluntary arrangements among independent firms that entail the exchange, sharing, and joint provision of various forms of knowledge (Powell & Grodal, 2005; Sammarra & Biggiero, 2008). Much knowledge, particularly managerial knowledge with rich tacit dimensions, is often transferred informally through processes of socialization and internalization (Powell, Koput, & Smith-Doerr, 1996). Of the various types of managerial knowledge, this paper studies the exchange of specific knowledge on human resource management, defined as “the pattern of planned resource deployments and activities intended to enable an organization to achieve its goals” (Wright & McMahan, 1992: 298).

A variety of network configurations exist, ranging from vertical or hierarchical to horizontal or collaborative arrangements. As such, it is possible to illustrate the flow of HRM knowledge as a continuum between pure diffusion and active dissemination: in the first case, the spread of knowledge about HRM is largely horizontal, informal and decentralized (Williamson & Cable, 2003) and in the second, the spread is dyadic often through vertical hierarchies, and is formal and centralized (Kinnie et al., 2005). With few exceptions, research on HRM knowledge flow remains limited to the more formal types of active dissemination in the field of international HRM, including the transfer of HR practices from the headquarters of multinationals to subsidiaries (e.g., Björkman & Lervik, 2007; Lawler & Hundley, 2008; Martin-Rios & Erhardt, 2008), and more or less formalized transfer of HRM knowledge within international joint ventures and strategic alliances (Schuler, Jackson, & Luo, 2004). This literature builds on the substantive body of research into intra-organizational knowledge transfer between headquarters and subsidiaries (Bartlett & Ghoshal, 1998; Tsai, 2001). A lot less research attention is focused on more cooperative, less instrumental, inter-firm arrangements as an important venue for HRM knowledge sharing, despite the amount of interest shown in knowledge creation and exchange in inter-organizational relationships (Håkansson & Ford, 2002; Johnston, Peters, & Gassenheimer, 2006).

Whether its focus is on highly formal strategic/innovation networks among alliance partners, or on less formal groups such as technological clusters of SME, existing research on HRM knowledge flow analyzes the pattern of diffusion of particular HR practices. For example, Williamson and Cable's (2003) study of top management team selection decisions shows that the wider social context, specifically inter-organizational network ties, shapes organizational HR decisions such as the hiring decisions of Fortune 500 companies. Other studies explore the role of universities, business schools, professional firms and consultants in the production and diffusion of management practices such as TQM (Westphal, Gulati, & Shortell, 1997), the spread of HRM ideas and practices in Italian magazines and newspapers (Mazza & Alvarez, 2000), inter-firm diffusion of HR IT innovative practices (Florkowski & Olivas-Lujan, 2006), and patterns between US firms' innovative orientations and how they approach new HR practices (Mirvis, 1997).

Regarding the reasons for HRM knowledge sharing, research suggests that arguments fall broadly into two categories: the “internal” or “external” benefits to the organization. The first category points towards an internal, strategic HRM argument that seeks to disseminate HRM knowledge as a means of driving organizational performance. The second category draws on factors other than organizational performance to address the potential of HRM knowledge sharing. For example, Sanchez, Kraus, White, and Williams (1999) state that the need to stay competitive may lead firms to search for and imitate innovative solutions developed by other firms. An exchange of this kind may happen among firms that participate in industry events (Stam, 2010), or via benchmarking to scrutinize an existing practice in other firms (Sanchez et al., 1999).

To date, however, few researchers have specifically explored inter-firm HRM knowledge flow, and consistent research aimed at elucidating the appropriate reasons for firms to take part in collaborative networks where HRM knowledge sharing may take place is still lacking (Martin-Rios, Erhardt, & Septiem, 2012).

The study's conceptual model addresses the transactional (formal) and embedded (relational and instrumental) components of HRM knowledge sharing (see Fig. 1). This model proposes that HRM knowledge flows across organizational boundaries for various reasons. Clearly, there are potentially positive consequences for firms that participate in inter-firm HRM knowledge networks. However, as the next section shows, a lack of research in this area means that the author anticipates doubts regarding the benefits of sharing HRM knowledge.

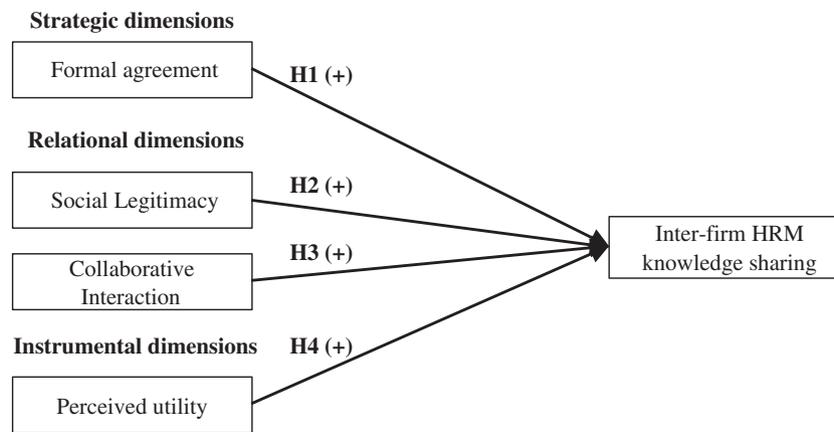


Fig. 1. Conceptual model (with relevant hypotheses).

2.1. Strategic dimensions of HRM knowledge sharing

One of the theories giving rise to a large body of HRM knowledge is the resource-based view (RBV) (Wright, McMahan, & McWilliams, 1994). According to the RBV, tacit knowledge as embodied in complex organizational tasks and built on experience tends to be unique and difficult to imitate, and so becomes very significant (Barney & Wright, 1998). Essentially, RBV stipulates that a firm's employees can provide its competitive edge, and that the HR practices can further foster this competitive edge by managing labor strategically. Efficient HRM is a potential source of competitive advantage because it is scarce, difficult to imitate, and helps to set firms apart from their competitors and generate sustainable competitive advantages (Barney, 2001; Barney & Wright, 1998; Boxall, 1996).

As a result, based on this logic, a firm would probably not willingly give away this HRM knowledge to its competitors (the know-how to conduct strategic recruitment, training, development, etc.). Since resources are firm-specific assets that are difficult, if not impossible, to imitate, part of the strategic component inherent in these specific assets would be lost in the event of inter-firm transfer, because this would reveal any critical knowledge, diminishing its value. From an RBV perspective, the participation of outside firms in HRM knowledge sharing may be potentially counterproductive, insofar as this exchange will, most likely, result in the loss of essential knowledge, mostly tacit, with the subsequent risk of losing the competitive advantage. Thus, the benefits arising from the acquisition of outside HRM knowledge cannot be offset by the risk of losing competitive advantage. To overcome this risk, firms support exchanging HRM knowledge when there are formal agreements. Therefore, this paper proposes that firms are more likely to engage in sharing HRM knowledge with those firms with whom they have formal ties, as in the case of commercial agreements.

H1. The existence of formal agreements between independent firms associates positively with HRM knowledge sharing.

2.2. Social network theory and inter-firm knowledge networks

Recent work seeks to extend the RBV from the rational reasons (tied to tangible benefits) of knowledge sharing to consider other motivations. One argument broadening RBV is that firms can seek benefits beyond contractual relationships (Arya & Lin, 2007). Literature on social networks stresses the importance of embeddedness of firms in social relations. Inter-firm relationships defined in this way are not only formal, but also display relational reasons in their motivations, including legitimacy, prestige or enduring collaborative relationships, and could also lead a firm to obtain a source of sustained competitive advantage (as anticipated by Oliver, 1997).

The inter-firm network literature looks at social structures associated with one or more types of interdependency (Grandori & Soda, 1995; Granovetter, 1985). As such, networks have the potential to provide firms with access to information, knowledge, status, markets, technologies and other resources (Inkpen & Tsang, 2005). According to social network theory, structural and relational embeddedness influence network configurations (Granovetter, 1995; Uzzi, 1997). Networks can be based on formal contractual relations (e.g., strategic alliances or subcontracting relationships) or on informal and non-market mediated relationships anchored in more primordial relations, such as friendship or proximity (Powell et al., 1996; Uzzi & Lancaster, 2003). Nevertheless, as networks evolve, relations do not remain fixed. Transactional networks can evolve into strong embedded and relational networks and informal ties can become contractual and highly calculative.

A central argument is that through membership of a network and the resulting enduring exchange relationships, firms have access to new sources of knowledge (Inkpen & Tsang, 2005), thereby facilitating organizational learning and creating and continuously developing the firm's dynamic capabilities (Teece, Pisano, & Shuen, 1997). As the literature on organizational learning reveals, firms capture the experience of other organizations through the exchange of experience (in the form of practices, routines and ideas) (Levitt & March, 1988); hence, they can reap certain benefits from developing broad networks of relationships (Szulanski, 1996). Through these contacts, they are exposed to and can learn from others' experiences in a variety of situations: setting up experimental projects, opening new markets or dealing with new customers, or the opportunities and difficulties they encounter when implementing new work policies (Beckman & Haunschild, 2002; Powell & Grodal, 2005; Sammarra & Biggiero, 2008).

Therefore, consider the existence of relational antecedents as an intermediate variable that is subject to the existence of inter-firm collaboration. This view may also explain why a particularly high degree of variance exists in the emergence of HRM knowledge networks. Both relational and instrumental reasons are critical to the success of HRM knowledge networks.

2.3. Relational dimensions

Recent social research uses the classic relational hypothesis of network closure—the proposition that actors separated by one intermediary are the most likely to become connected in subsequent time periods (Davis, Holland, & Leinhardt, 1971). These studies emphasize the structural assumption that “the selection of relationships, the maintenance of existing ones, and the dissolution of old ones are conditioned by trust, information, and opportunities for interaction that are structured by the network” (Rivera, Soderstrom, & Uzzi, 2010).

Some authors deem relational mechanisms, such as social connectivity, reciprocity and trusting relations (Easterby-Smith et al., 2008), to be crucial in the flow of knowledge, ideas or experiences among firms (Appleyard, 1996; Uzzi, 1997; Wellman, 1983).

2.3.1. The partner's social legitimacy and prestige

Legitimation refers to the social justification of an actor or activity, such that the actor or activity is publicly validated or endorsed (Perrow, 1961). In this sense, the enhancement of organizational legitimacy is also cited as a significant motive in the decision taken by firms to establish links. An organization may participate in inter-firm networks to demonstrate or improve its reputation, image, prestige, or congruence with prevailing norms in its institutional environment. Institutional theory (Dimaggio & Powell, 1983, 1991; Hirsch, 1975; Meyer & Rowan, 1977; Scott, 2001) suggests that institutional environments impose pressures on organizations to justify their activities or outputs. Kogut, Shan, and Walker (1992) propose that inter-firm relationships are formed as organizations attempt to improve their reputation, usually by establishing links with firms of greater prestige. These pressures motivate organizations to increase their legitimacy in order to appear to be in line with the rules, beliefs, or expectations of external constituents. Podolny and Page (1998) further argue that this legitimacy or status may have positive economic benefits for the actor, ranging from survival to organizational growth to profitability.

Empirical studies that specifically relate legitimacy to inter-organizational HRM knowledge networks are few but noteworthy. For example, Kossek (1987) mentions factors of legitimacy and prestige as reasons for a firm's executives to participate in organizational networks and to share information on HRM innovations. Also, Williamson and Cable (2003) refer to legitimacy when they suggest that decision-makers mimic the practices they believe to have produced positive outcomes for other firms. Interpersonal and inter-organizational networks may also examine an organization's innovativeness in relation to the influence of other organizations; this is particularly the case with HR practices implemented by organizations that are regarded as leaders in the field.

H2. A partner's social legitimacy and prestige associate positively with HRM knowledge sharing among independent firms.

2.3.2. Collaborative interaction

Dyer and Singh (1998) distinguish collaborative interaction from transactional or hierarchical interaction. A considerable proportion of the literature on inter-firm relationships implicitly or explicitly assumes that participation in inter-firm networks facilitate the emergence of embedded, non-transactional inter-firm collaborative action (Granovetter, 1992; Malmberg & Power, 2005; Simonin, 1997). The establishment of such collaborative ties may have a positive impact on knowledge sharing (Oliver, 1990; Parmigiani & Rivera-Santos, 2011). These collaborative ties often involve a degree of trustworthiness and reciprocity; firms participating in networks may feel a sense of obligation to the other parties (Granovetter, 1995; Powell, 1990; Powell & Grodal, 2005; Uzzi & Lancaster, 2003). For example, research on intrafirm knowledge sharing documents the importance of enduring inter-unit interaction to transmit new ideas within multiunit organizations (e.g., Ghoshal, Korine, & Szulanski, 1994; Tsai, 2001). Similarly, an organization may participate in inter-firm networks to increase the strength of relationships, or so that other firms see it as a trustworthy partner.

Collaborative interactions may lead to opportunities of multiple knowledge exchanges (Oliver, 2004). Thus, collaborative dynamics are associated with the establishment of interactive ties that potentially foster knowledge sharing, and specifically HRM knowledge. The argument here is based on the idea that highly collaborative firms—which share their HRM knowledge with other firms—will

also be active recipients of knowledge (Kogut, 1988, 2000; Schultz, 2001).

H3. The level of collaborative interaction among independent firms associates positively with HRM knowledge sharing.

2.4. Instrumental dimensions

2.4.1. Perceived utility of a partnership tie

As to why organizations engage in collaborative relations with each other, the literature on inter-organizational networks not only indicates relational factors such as legitimacy and prestige, but frequently points toward advantageous or value-derived motives. Indeed, it is important to address the instrumental dynamics between firms and the flow of knowledge. These dynamics capture the economic logic behind links among firms (Granovetter, 1992). Several recent studies examine how firms' network positions are shaped deliberately by partner choices in selecting what type of advantage to pursue (Powell & Grodal, 2005). In this view, firms participate in networks with the aim of developing enduring exchange relationships of strategic significance (Gulati, Nohria, & Zaheer, 2000).

Extensive evidence suggests that most inter-firm relationships (ties) are primarily established for the tangible benefits that ensue, both strategic and financial (Oliver & Ebers, 1998). A second set of intangible benefits relates to the exchange of learning and knowledge (Crossan & Inkpen, 1994; Hamel, 1991; Kogut, 2000; Parkhe, 1991). The underlying assumption is that firms share knowledge with the expectation of receiving something in exchange. The perceived usefulness of establishing and maintaining instrumental relationships with a given firm is expected to be positively related to participation in HRM knowledge sharing.

H4. Perceptual, subjective utility of a partnership tie associates positively with HRM knowledge sharing among independent firms.

3. Methods

The relational nature of the research questions under study determines this paper's focus on social network data. In this study, network data aims to capture the actual inter-organizational dynamics of HRM knowledge flows. Social networks have proven to be a powerful tool for understanding social dynamics and social structures tied to one or more types of interdependency. A network consists of a set of nodes (individuals, groups or organizations) with links representing specific types of relationships between them (Wellman, 1983). Links between pairs of nodes may represent a wide range of connections (Tichy, Tushman, & Fombrun, 1979) with one or multiple objectives (e.g., information acquisition and knowledge sharing). Social network analysis studies either whole networks (also known as complete networks) or personal networks (also known as egocentric networks). While the former of these refers to all ties that contain specific relations within a defined population, the latter indicates any ties that an agent may have—such as “personal communities”. One of the main challenges when studying networks is to adequately specify their boundaries (Gulati, 1995). For the purposes of this study, I chose a complete network of firms, and the network I selected was not based solely on formal contractual relations (e.g., strategic alliances or subcontracting relationships). Rather, the focus is on a network based on multiple ties and a common affiliation within a science and technology parks.

3.1. Research setting

The science and technology park selected for this research, *Parque Científico y Tecnológico de Leganés* (hereinafter, PCT Leganés) is in the metropolitan area of Madrid, Spain. Established in the year 2000 by University Carlos III of Madrid in conjunction with local, regional

and national public agencies, PCT Leganés serves as a good example of a university park. It not only acts as a business incubator, but also provides both institutional support for high-tech start-ups and basic services for long-established firms. Overall, the park comprises 38 firms, including start-ups, established firms, and branches of multinational firms, 12 university spin-offs and developing business ventures, and six R&D centers including publicly funded research institutes, university funded research institutes and R&D consortiums between firms and the university (e.g., the EADS-Carlos III University Center for Aerospace Integrated Systems). The initial sample excludes all business projects in the business incubator and all R&D centers without a clear business vision.

3.2. Data collection

To obtain a better understanding of how HRM knowledge flows among informal inter-firm networks, I drew up a questionnaire to map knowledge flow among those people responsible for maintaining relationships with other firms, relying on accepted instrument development guidelines for the social network survey instrument (in particular Borgatti, Everett, & Freeman, 2002; Scott, 1991; see also Wasserman and Faust (1994) for a discussion of survey instruments for social network analysis). Surveys included a complete list of all firms in the PCT Leganes (a total of 51, including the Technology Office). This so-called roster method facilitates individuals' recall of typical patterns of interaction and has shown itself to be reliable (Labianca, Brass, & Gray, 1998). I asked each participating firm to mention the organizations with which they had exchanged information during the last year, what was important to them, and how.

Relationships within the actual network between actors (firms) i , j and k can be transactional (based all or in part, on a formal agreement) or embedded (relational ties embedded in social attachments) (Friedman & Podolny, 1992; Uzzi & Lancaster, 2003). The survey includes examples of the kind of HRM knowledge to exchange. It considers a broad pool of people management practices and listed 10 different HR practices (e.g., recruitment/selection, training, compensation) that the strategic human resource management field uses frequently (Huselid, 1995) (see Appendix).

I attempted to call each CEO in the sample by phone so that every organization had a 100% probability of being sampled. After explaining the overall aim of the study, the author asked to interview and collect social network data from the most knowledgeable informant (Kumar, Stern, & Anderson, 1993) who could best assess the type of knowledge diffused and how. In several cases, the CEO referred the author to another senior manager who was either formally or informally responsible for managing the firm's day-to-day relationships with other firms. This person was typically the head of HR (vice-president, senior HR manager, or similar).

Fieldwork lasted eight weeks and the population consisted of 51 firms (including the Technology Office at PCT Leganés). A total of 41 firms responded to the social network questionnaire, which represents a response rate of 80.4%. The remaining 10 firms either refused to participate after several telephone calls or could not be contacted. Since the study reports on the dyadic level, respondent firms were asked to report knowledge exchanges with any of the 51 firms of the whole population (by means of census, rather than by sample). Knowledge exchanges can be asymmetric; a firm may report sharing knowledge with another firm that may not answer the survey. Based on existing research (Levin & Cross, 2004; Sammarra & Biggiero, 2008), this study focuses on the knowledge seeker's perception—the non-missing value (when A answered that shared with B although B did not mention A). This was based on the assumption that knowledge exchanges between firms may involve several actors from each firm; so not every instance respondent may recall or be aware of certain exchange instances. The 2550 ties (51×50) between these firms constitute the network data for the analyses. Table 1 shows

the descriptive data for the sample. The firms sampled have existed for an average of 17 years. Ninety percent are small to medium-sized enterprises (SMEs), while 10% are large enterprises with more than 200 employees and sales exceeding 15 million euros. Thirty-three of the interviewed firms (66%) are in high-technology related services and seventeen (34%) are in high- or medium-high technology manufacturing industries.

3.3. Dependent variable

To investigate the patterns of HRM knowledge sharing in inter-firm networks, the author asked each respondent to indicate the firms from which they received HRM knowledge. A "roster" question format was used, with respondents selecting their answers from a list containing all 51 firms in the Park, and without any constraint on the maximum number of selections that each respondent could make, then inputting these data in matrix format to create an inter-firm HRM knowledge sharing matrix, representing HRM knowledge obtained by the respondent firm from other firms in the Park.

3.4. Independent variables

3.4.1. Formal agreement

The firms had to indicate the extent to which they had formal agreements with other firms in the Park. These agreements could include commercial contracts, co-production, joint contracts or technology exchange agreements; the relationship thus had to be characterized by some formal agreement and to hold some specified right over the result of cooperation (Grandori & Soda, 1995). I then input these data in matrix format to create a formal agreement matrix.

3.4.2. Collaborative interaction

The firms had to indicate the frequency of inter-organizational collaboration with which they exchanged HR-related information with other firms in the Park. I then entered these data in matrix format to form a collaboration matrix. Next, I focused on the strength of interaction. For the purpose of this study, it is defined as the ratio of the number of ties that are reciprocated to the total number of ties (Wasserman & Faust, 1994). To symmetrize the data, the product routine is used that characterizes the strength of the symmetric relation between A and B as the product of AB and BA, making it possible to assess the level of interaction and whether or not a relationship was regarded as "strong".

3.4.3. Partner's legitimacy

To address the issue of legitimacy, respondents rated their relationships with firms with which they had contact, on a scale of 1 (strongly disagree) to 5 (strongly agree). Focusing on the broader concept of

Table 1
Description of sampled firms.

Variable	Frequency distribution (N = 51)			
1. Industry	Manufacturing	Services	Other	Total
Average (%)	17 (33.3)	33 (64.7)	1 (1.9)	51 (100)
2. International	Domestic	International	Total	
Average (%)	24 (48)	26 (52)	50 (100) ^a	
3. Age	10 or less	11–20	More than 21	Total
Average (%)	17 (33.3)	31 (60.8)	3 (5.9)	51(100)
4. Employees 09	Less than 25	25–200	More than 201	Total
Average (%)	15 (35.7)	23 (54.8)	4(9.5)	42(100) ^b
5. Sales 09	Less than 1	1–15	More than 15	Total
(Euro millions)				
Average (%)	10 (23.8)	22 (52.4)	10(23.8)	42(100) ^b
6. Origin	Independent	Spin-off	MNCs	Total
Average (%)	38 (74.5)	11 (21.6)	2 (3.9)	51(100)

^a 1 missing case.

^b 9 missing cases.

legitimacy, which may be closely related to other dimensions such as prestige or credibility, a series of statements regarding the standing of the firm served to measure legitimacy: (1) “This firm has expertise in areas that are important in the kind of work I do;” and (2) “This firm is recognized by their HRM and the way it is managed.”

3.4.4. Perceived value of a partnership tie

To address the perceptual or subjective value that respondents attached to the firms in the knowledge network, respondents rated the helpfulness and convenience of the contact with these firms on a scale of 1 (strongly disagree) to 5 (strongly agree). The specific statement used was: “Having a relationship with this firm is helpful and convenient for my own firm”.

3.5. Control variables

Basing the control variables on the inter-organizational literature (Appleyard, 1996; Powell & Grodal, 2005; Sammarra & Biggiero, 2008), which assumes that similarity between firms increases the probability of establishing ties and engaging in certain exchanges, I controlled for the possibility that firms in the same industry may engage in more collaborative ties and more exchange of HRM knowledge than firms in other industries (e.g., Kinnie et al., 2005). After splitting *Industry* into main big groups: high-technology services (Industry 1) and firms in high-to-medium-high technology manufacturing (Industry 2), *Industry* is operationalized creating a 51 × 51 matrix, coding each firm as “1” if both organizations in the dyad are in the same industry and “0” if they are in different industries.

Since several firms in the sample were international from start-up, they may be inclined to use partners to overcome obstacles to internationalization. Internationalization is also used to assess the extent to which firms engage in informal sharing of HRM knowledge. As in the case of *Industry*, a 51 × 51 matrix codes each firm to be a “1” if both organizations in the dyad are operating internationally and “0” if they are in different industries.

3.6. Analysis and hypothesis testing

The UCINET software package (Borgatti et al., 2002) is used to process the network data, while the NetDraw utility (Borgatti, 2007) is used for the network maps or “sociograms” presented in the following section. Sociograms represent the network as a series of nodes (i.e., single points on the diagram). These nodes denote firms, connected by linear ties (i.e., lines joining the nodes), indicating an exchange of knowledge between firms. In order to generate these sociograms, this research uses software packages that automatically transform raw statistical data into sociograms. Individuals with the greatest number of ties to others are placed at the center of the network and are known as focal nodes. The software groups relationships into clusters and adjusts the length of ties where possible, also calculating network indexes that measure the intensity and pervasiveness of knowledge sharing through external ties.

Network regression is used to test the hypotheses statistically, specifically the quadratic assignment procedure (QAP) multiple regression technique. This approach permits an analysis of relational data (in sociomatrixes) and the results of this analysis can be interpreted in a similar way to the results of ordinary multiple regression. Network data do not satisfy assumptions of statistical inference, because relational data are systematically interdependent and autocorrelation is an inherent problem in this data; therefore, classical regression techniques, like ordinary least square, are not appropriate here. MRQAP provides a better alternative, as it allows direct comparison of matrix-level data and corrects the autocorrelation problem (Krackhardt, 1987, 1988) and has been applied extensively in previous social network research (e.g., Borgatti & Cross, 2003; Labianca et al., 1998; Tsai, 2001).

QAP is a nonparametric statistical algorithm that regresses a dependent matrix on one or several independent matrices. This algorithm first performs a standard multiple regression across corresponding cells of the dependent and independent matrices, and then randomly permutes rows and columns of the dependent matrix and recomputes the regression. The algorithm repeats the permutation regression process a large number of times (in this case, 12,000 times) to estimate the standard error for the statistics of interests. This procedure determines whether the association between two matrices is a random occurrence and helps adjust for the autocorrelation problem.

4. Results

4.1. Visualizing knowledge sharing and HRM knowledge flow

The existence of collaborative relationships in the Technology Park and the importance of inter-firm networks of HRM knowledge in this setting make it possible to investigate how independent firms exchange HRM knowledge with each another. Fig. 1 shows the visualization of the examined networks and the structural position of the firms within both (see Fig. 2). The nodes represent individual firms, and the arrows illustrate knowledge sharing and HRM knowledge flows.

Fig. 2 presents two images of inter-organizational networks: the image on the left shows the global network of organizations involved in knowledge exchanges of any kind; the other image on the right shows the specific HRM knowledge network. In both figures, firms appear as circles. Ties have arrowheads indicating the direction of nominated exchange choices. The centrality of each firm (i.e., the number of ties a firm has to other firms) is represented by the size of the node (i.e., bigger nodes represent higher centralities), and it is possible to observe the value of ties (i.e., the strength of the relationship) by their thickness (i.e., thicker lines represent higher values). Taken together, the two images illustrate the different ways in which networks and knowledge flows can interact. Both networks reveal that direct firm-to-firm relationships are well consolidated, with few firms isolated from the rest of the firms in the park. As regards the informal HRM knowledge network, the existence of considerable relationships to share HRM knowledge can be seen. Although densities cannot be compared between networks of different sizes and actors (Scott, 1991), intuitively these results contrast with previous studies on informal knowledge sharing, where knowledge exchanges are more sparse (Boschma & ter Wal, 2007; Rank, Rank, & Wald, 2006).

4.2. Testing the inter-firm flow of HRM knowledge

Table 2 shows the matrix of correlations among all of the variables in the model. Several independent variables relate significantly with the dependent variable, but within acceptable limits in social networks for their inclusion in a regression model (see for example, Borgatti & Cross, 2003).

The study tests H1 to H4 by conducting a multiple regression QAP (MRQAP) analysis. The coefficients appearing in Table 2 are standardized regression coefficients. Model 1 only contains the three control variables. The results in Table 3 show that on their own, the controls have no direct effect on HRM knowledge sharing. Table 3 shows with reference to model 2 that the existence of previous formal agreements between firms ($\beta = 0.102$; $p < .001$) significantly affects HRM knowledge sharing after controlling for industry (service and manufacturing) and internationalization. This fully supports hypothesis 1. Models 2 and 3 suggest that the relational dimensions collaborative interaction ($\beta = 0.064$; $p < .001$) and credibility ($\beta = 0.284$; $p < .001$) are related to HRM knowledge sharing after controlling for industry and internationalization. These results provide full support for Hypotheses 2 and 3. Model 5 shows that instrumental embedded dimensions associated to the perceived utility or value tied to inter-firm relationships is

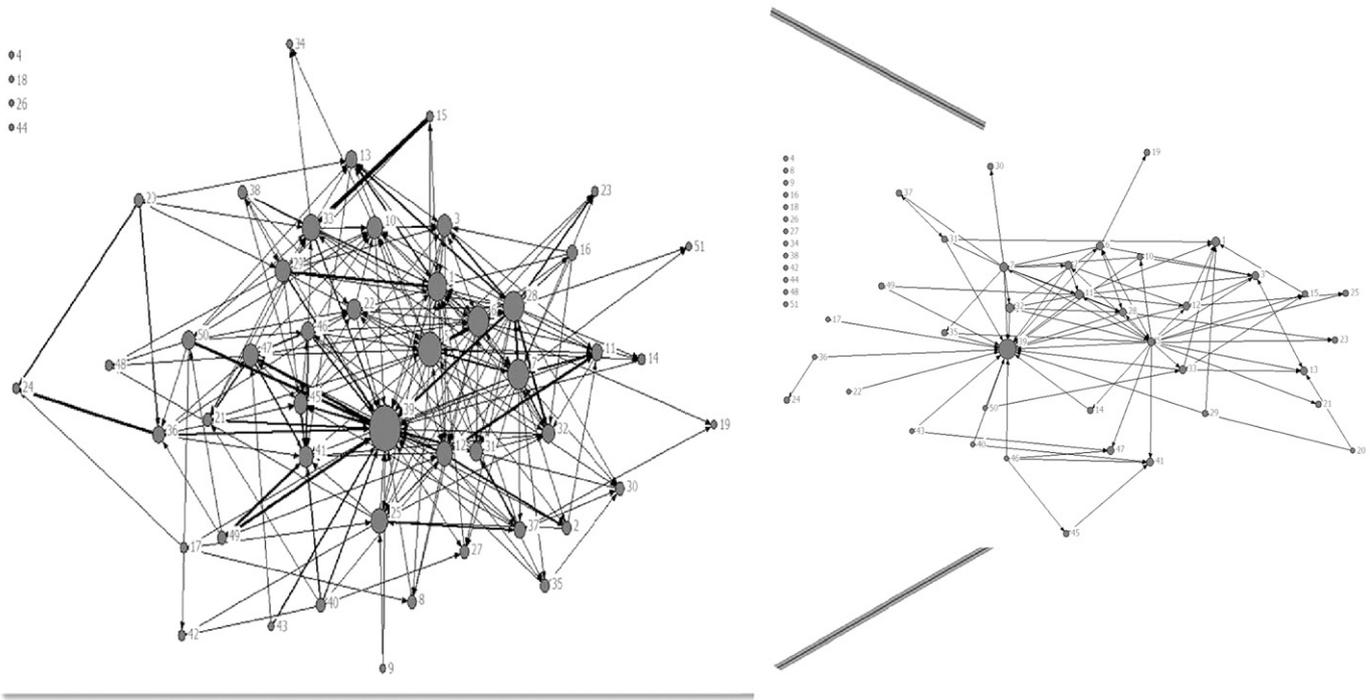


Fig. 2. Freeman's degree centrality of inter-firm collaboration network (on the left) and HRM knowledge network on the right.

positively associated to HRM knowledge sharing ($\beta = 0.338$; $p < .001$), fully supporting H4.

The study then examined the mediated relationship between formal dimensions (existence of formal agreements between firms) and relational and instrumental dimensions (embedded relationships). Model 6 shows that the standardized regression coefficients of formal agreement and HRM knowledge sharing drop considerably, although still significant. At the same time, the standardized coefficients for collaborative interaction and credibility remain significant, along with perceived utility suggesting direct positive effects of embedded dimensions on HRM knowledge sharing. The amount of variance explained in model 6 (39% of the variance) indicates that formal and embedded dimensions explain a substantial portion of the variance in the probability of inter-firm flow of HRM knowledge.

5. Discussion

This study aims to untangle the social processes and inter-firm mechanisms that underlie HRM knowledge sharing. I argue that two key properties of inter-firm networks—formal agreements and social embeddedness—play important roles in HRM knowledge flow. While there is an established research domain on how firms share HRM knowledge in formal inter-organizational networks (such as strategic alliances or mergers and acquisitions), there is a limited

focus on the antecedents for this phenomenon between organizations in relational networks.

One possible explanation for the absence of previous substantive research relates to the theoretical perspectives underpinning the field of strategic HRM. According to the resource-based view of the firm, firms that participate in informal sharing of HRM knowledge may be at risk of rendering certain knowledge that is strategic to their organizations (for example, knowledge regarding certain HRM innovations), with the ensuing loss of competitive advantage. Despite the compelling postulate of the theory, this argument presents a puzzle. On the one hand, postulates of this kind establish the advisability of participating in inter-firm exchanges of technological and product knowledge—the acquisition of new knowledge as a source of competitive advantage (Easterby-Smith et al., 2008). On the other hand, these same postulates also argue against firms participating in similar HRM knowledge exchange networks.

As this study contends, social network theory provides alternative arguments in favor of the participation of firms in HRM knowledge networks, as firms may derive certain value from inter-firm knowledge exchanges. In particular, social network theory suggests that business relations are mixed with social relations (Granovetter, 1985). The resulting relational embeddedness of firms in social networks accounts for the enhanced trust between firms and the establishment of legitimacy among participating firms. Using social network analysis, this article

Table 2
QAP correlation matrix.

Variable	Mean	s.d.	1	2	3	4	5	6	7
1 Diffusion HRM knowledge	.04	.16							
2 Industry (hi-tech services)	.28	.45	-.022						
3 Industry (hi-tech manuf.)	.06	.24	.007	-.158*					
4 Internationalization	.26	.44	.052	-.137*	.121				
5 Formal agreement	.03	.18	.316**	-.003	-.028	-.005			
6 Collaborative interaction	.16	.51	.636**	.026	-.013	.010	.404**		
7 Perceived utility	.29	.98	.532**	-.009	.005	.031	.346**	.750**	
8 Social legitimacy	.22	.89	.582**	-.050	.023	.063*	.359**	.658**	.738**

* $p \leq .05$.
** $p \leq .01$.

Table 3
Results of quadratic assignment procedure regression analysis for predicting diffusion of HRM knowledge.

Predictors	Model 1	H1: partnership	H2 and H3: relational reasons		H4: instrumental reasons	Overall model
		Model 2	Model 3	Model 4	Model 5	Model 6
<i>Control variables</i>						
Industry (tech)	−.007	−.006	−.005	−.005	.003	.001
Industry (man)	−.001	.006	−.002	.001	−.006	−.001
International	.022	.023	.015	.023*	.008	.010
<i>Network variables</i>						
Formal agreement		.350**				.092**
Social legitimacy			.127**			.001**
Collaborative interaction				.001**		.081**
Perceived utility					.105**	.041**
P	.000	.000	.000	.000	.000	.000
N	2550	2550	2550	2550	2550	2550
Adjusted R ²	.064	.102	.064	.284	.338	.389

* p ≤ .05.

** p ≤ .01.

shows that these informal but cooperative arrangements are amenable for HRM knowledge exchanges among independent firms. Participating firms may learn about HRM and increase their internal stocks of HRM knowledge, as well as maintain or increase legitimacy and prestige. This study aims to make a contribution by extending the focus of the flow of knowledge exchanged in inter-firm networks to sources of HRM knowledge.

This study therefore provides an important bridge between social network and human resource theorists by identifying both the structural factors that influence inter-firm HRM knowledge sharing, also explaining the development of channels that enable HRM knowledge to spread across organizations, particularly with respect to the levels of trustworthiness, strength of collaborative interaction, and firm prestige that are necessary for this exchange among independent firms.

This study has a number of limitations. My findings may be influenced by the selected setting. The firms were located in a science and technology park, which by definition is a setting amenable to inter-firm collaboration. As HRM knowledge sharing may not be a sufficiently relevant reason to participate in an inter-firm network, I chose a setting that was favorable to exchanges of this kind. The absence of highly institutionalized relations in the recently established technological cluster provides potential advantages for the study of emerging relationships and growing embeddedness. While knowledge networks in this context may be relatively weak, they are also more open and democratic, which in turn may provide further opportunities for cooperation and future commercial engagements. This bias may influence the results.

The study ignores the influence of institutional factors in fostering exchanges, and the study does not address coercive and mimetic reasons for knowledge exchange. Firms may be compelled to participate in knowledge networks because they are forced to or feel (see Kinnie et al., 2005). In all likelihood, these aspects of institutional forces and knowledge networks will be important in fully understanding the size and relevance of inter-firm HRM knowledge networks, but are beyond the scope of this work.

Another limitation of the study is that the generalizability of the main results is likely to improve if they include firms and institutional actors that frequently participate in knowledge networks. It is necessary to expand on the role of inter-firm networks for a wider set of actors in order to identify complex flows of HRM knowledge. Each of these limitations represents an exciting area for future research.

5.1. Managerial implications

This study implies that HRM functions may play a critical role in providing a direction for building the infrastructure (i.e., map and

create business networks), promoting necessary inter-organizational ties (i.e., enable the firm to interact and build strong relationships), and overcoming resistance to go outside the organization. In this sense, HRM professionals are encouraged to come together at conventions, congresses and conferences, to share challenges they face and exchange ideas for new solutions. Participation in events like these helps firms to identify the state-of-the-art HRM, share both explicit and tacit knowledge, take stock of relative competitive implementation of HRM practices and systems and find out about future trends in HRM.

Developing inter-firm relationships is ultimately an organizational property and, therefore, must be sustained. Human resource managers in collaborative networks may be able to obtain HRM information in a timely manner, and may also benefit from the exchange of HRM knowledge. Many firms may improve their competitive advantages through effective participation in inter-firm knowledge sharing. Managers can maneuver strategically in order to secure key positions in a variety of network configurations, such as participating in collaborative, proximal networks that provide access to innovative HRM knowledge or other resources and, at the same time, forging strategic alliances with key allies. However, the two types of networks pose alternative strategic implications for sharing HRM information. While it may be disadvantageous to do so from a direct competitive position, sharing knowledge may help firms to increase their reputation or help to attract and retain employees (i.e., listed as a desirable place to work) (Gardner, Erhardt, & Martin-Rios, 2011).

6. Conclusion

If inter-firm networks are crucial to knowledge flow, and arguably to organizational learning and competitiveness, this study focuses on why firms develop collaborative relationships to increase their access to HRM knowledge. To date, little is known about the successful management of HRM knowledge sharing in inter-firm networks, or about the dyadic relationships between firms that potentially enhance the level of collaboration required to prompt HRM knowledge sharing. One reason that may account for the absence of empirical research is that the flow of organizational and managerial knowledge occurs more often in informal, cooperative ways, whereas most research tends to look at formal, instrumental, agency-driven exchanges of knowledge (e.g., technological knowledge). Therefore, this analysis is especially relevant for the successful management of knowledge flows, in particular with respect to the levels of collaboration and trust that are required for independent firms to actually exchange HRM knowledge.

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