



The impact of upper and lower echelon human capital and HR practices on innovation in start-ups

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Abstract

Innovative start-ups have become the center of attention in government policy. They are considered to be the driving force of economic growth and international competitive advantage. Despite this growing interest, little is known about firm internal determinants of and critical success factors for innovation in newly established firms. Innovation is a function of a firm's ability to create, manage and maintain knowledge. Since knowledge is created by and stored within individuals, human resources as well as HR practices may play an important role as drivers of innovation in start-ups. We expect that start-ups having superior human resources (both owners/managers and employees) and an intensive HRM, are more able to innovate. Results show that unless employees' human capital is managed, it provides little benefit to start-ups in terms of innovation. Moreover, the impact of HRM intensity is higher in start-ups with high human capital as compared to newly established firms with low human capital. Next, innovation is indirectly (through the mediating effect of employees' human capital and/or HRM) and positively affected by the owners/managers' educational level and the appeal to certified experts. Industry experience, in turn, has an indirect negative impact. The number of independent board members directly and positively influences innovation.

Key words: human capital, human resource management, innovation, upper echelon, start-ups

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Introduction

In many countries, new business creation is put forward as a way to decrease unemployment and to cope with fast-growing Asian economies (e.g. USSBA, 2004; Pact van Vilvoorde, 2001; Progress Report of the European Council in Lisbon, 2000). Especially innovative start-ups, i.e. newly established firms aiming at an innovation strategy, receive increased attention. They are believed to boost innovation in existing industries and create new industries, thereby contributing to employment, competitiveness and wealth creation (Acs & Audretsch, 1990; Schumpeter, 1934; Wong et al., 2005). Despite this rising interest, little is known about firm internal determinants of and critical success factors for innovative output in start-ups.

In line with upper echelon theory (Hambrick & Mason, 1984), innovation is often associated with the human capital of owners/managers, derived from their education and past experience (e.g. Barker III & Mueller, 2002; Hadjimanolis, 2000; Hoffman & Hegarty, 1993; Lynskey, 2004). Several arguments have been put forward to substantiate on the positive relationship between top managers' human capital and innovation. First, formal education, exposure to and experience in other organizations determine the unique set of skills or knowledge base that owners/managers bring to the organization (Boeker, 1997). Second, highly educated owners/managers seem to be more receptive to new ideas (Hambrick & Mason, 1984). Finally, prior experience plays a prominent role in successful opportunity recognition (Hills & Shrader, 1998; Shane, 2000). Especially in the first stage of a firm's life cycle, owners/managers play a pivotal role. They are the central actor in conceiving the company's strategy and, subsequently, in selecting and managing crucial resources to implement the desired strategy (Baird & Meshoulam, 1988; Bergmann Lichtenstein & Brush, 2001). In accordance with the aforementioned arguments, owners/managers' human capital is considered to be an important – in fact the most important – determinant of innovation in start-ups.

Despite evidence of this relationship (Lynskey, 2004), we argue that other important sources of human capital that may likewise influence innovation, are neglected. First, the human capital or knowledge base of owners/managers can be extended in a number of ways. Installing a board of directors with one or more independent board members (Zahra et al., 2000) and/or making an appeal to certified experts (Chrisman & McMullan, 2004), for example, provide owners/managers with new knowledge. The combination of new and existing knowledge incites a learning process, the creation of fresh insights and the discovery of new opportunities. Moreover, through contacts with independent board

members or experts the social network of owners/managers expands. This may, under certain circumstances, enhance the capacity for creative action (Ruef, 2002). Second, although employees are few in numbers in start-ups, owners/managers do mention them as necessary resources (Bergmann Lichtenstein & Brush, 2001; De Winne & Sels, 2005). They are carriers of tacit knowledge and carry out the productive and innovative work of the firm. In line with previous research in large firms (Smith et al., 2005; Subramaniam & Youndt, 2005), we assume that the success of innovation projects in start-ups also depends on the human capital, i.e. the knowledge and competences, of employees. Finally, in line with the resource based view of the firm, we argue that valuable employees are not sufficient to outperform competitors. They should be managed and controlled in a way that enables the firm to implement its desired strategy (Barney, 1995), in this case an innovation strategy. Therefore, we expect that the presence of HR practices focusing on (1) the deployment, development, evaluation and disposal of employees, and (2) the enhancement, support or change of organizational processes sustaining an innovation strategy, will have a positive impact on innovation as well (Shadur & Snell, 2002).

The purpose of this study is to examine the impact of upper echelon human capital (i.e. the human capital of owners/managers and the presence of mechanisms to expand the owners/managers' knowledge base), lower echelon human capital and HR practices on innovation. We therefore rely on a sample of *innovative start-ups*, i.e. newly established firms aiming at an innovation strategy. The study aims at answering two research questions: (1) To what extent do upper and lower echelon human capital and/or HR practices contribute to innovation in start-ups?; and (2) Do lower echelon human capital and/or HR practices mediate the relationship between upper echelon human capital and innovation in start-ups? The added value of this study is threefold. We contribute to existing research on innovation in entrepreneurship literature by proposing an integral framework including the aforementioned owners/managers and employees related determinants of innovation. Doing so, we increase insights in the mechanism through which characteristics of owners/managers influence innovation, the central focus in upper echelon research. Studying the relationship between (different kinds of) human capital, HR practices and innovation, we contribute to HRM-performance research which traditionally concentrates on HR practices (e.g. Laursen & Foss, 2003; Michie & Sheehan-Quinn, 2001).

The remainder of this paper is organized as follows. In section 1 we give an overview of existing literature on the relationship between human capital, HRM and innovation. Section 2 concentrates on the development of the conceptual framework and research hypotheses. In section 3 we focus on the research design (sample, measures and analysis) used. Section 4 describes the results. We end with a discussion and suggestions for future research.

Literature review: human capital, HRM and innovation

Innovation, in its broadest sense, is about deliberate incremental and radical changes in existing products/services, processes or the organization in order to achieve a competitive advantage over competitors (Hislop, 2005). It is seen as a necessary condition to ensure a firm's survival and success in today's economy, characterized by increasing worldwide competition and ever more pressing environmental turbulence (Shipton et al., 2006). As a result, encouraging innovative activities has been put on top of the policy agenda in many Western countries. In the Progress Report of the European Council in Lisbon (2000) the objective '*to become the most competitive and dynamic knowledge-based economy in the world*' has been explicitly pronounced. To attain this objective, the European Union wants to stimulate established firms to innovate and encourage the creation of innovative start-ups. The crucial role of human capital, i.e. the knowledge, skills and abilities residing with and utilized by individuals (Subramaniam & Youndt, 2005), in spurring innovation is thereby recognized. Innovation is a function of a firm's ability to create, manage and maintain knowledge (Smith et al., 2005). Since knowledge is created by and stored within individuals (Grant, 1996; 1997), human resources as well as practices influencing (the value of) human resources play an important role in the innovation process.

Parallel with the policy makers' growing awareness of the role of human capital in answering the current competitive demands (Lengnick-Hall & Lengnick-Hall, 2003), academic research on the effect of human capital and the management of human capital on innovation has increased. The topic has been studied in various research strands, such as upper echelon (Barker III & Mueller, 2002), entrepreneurship (Chrisman & McMullan, 2000), small business (Hadjimanolis, 2000), corporate entrepreneurship (Zahra et al., 2000), strategic human resource management (Shipton et al., 2006), and innovation literature (Smith et al., 2005). Table I gives a chronological overview of existing empirical research on HR related variables and organizational innovation. We only present the findings relevant to this study. This overview is not exhaustive. Yet, it enables us to pronounce upon the state-of-the art of studies on this topic and detect the main empirical gaps. These empirical flaws will be the point of departure for the development of our conceptual framework.

Table I Overview of existing literature on the relationship between HR related determinants and innovation

Reference	Independent and dependent variable(s)	Sample	Conclusion
Hoffman & Hegarty (1993)	Executive characteristics Functional expertise Product/market innovation New products, new markets, new segments Administrative innovation New planning process, structure & training programs	Large firms	The variance in innovations is largely explained by executive characteristics rather than by organizational or environmental characteristics. Functional expertise seems to be the most dominant and equally important predictor for both types of innovations.
Kalleberg & Moody (1994)	HR practices Decentralization; presence of training in the past 2 years; presence of firm internal labor markets; presence of cash or stock bonuses for employee performance or merit and presence of profit sharing or stock-option programs Development of new products, services or programs (relative to competitors)	Firms with one or more paid employees (including self-employed owners)	Firm internal labor markets, training and compensation positively and significantly correlate with product development and innovation. Organizations were clustered based upon four HR variables (firm internal labor markets, training, compensation and participation). The group of organizations scoring high on each of the four HR variables is the most innovative cluster.
Ngo et al. (1998)	HR practices Structural training & development; retention oriented compensation; seniority based compensation; and diversity. Development of new products/ services (compared to the industry's average)	Firms with 50 employees or more	Retention-oriented compensation and structural training & development have a positive and significant effect on new product development.
Michie & Sheehan (1999)	HR systems Choice between three HR systems, from no innovative work practices to intensive use of innovative work practices R&D expenditure Introduction of advanced technological change	Trade firms with 25 employees or more	Firms using more innovative work practices are more likely to engage in R&D and introduce technological change.
Hadjimanolis (2000)	O/M human capital Cosmopolitanism; previous work experience in relevant sectors; type of entrepreneur (including educational level and his/her technical versus managerial capability) New products and expansion in new markets	Firms with less than 100 employees	Owners/managers are the orchestrators of resource accumulation and capability development in small firms. Owners/managers' characteristics, such as previous work experience, educational level, cosmopolitanism, risk propensity, and foresight have a positive impact on the innovativeness of the small firms.
Chrisman & McMullan (2000)	SBDC (small business development center) counseling is intended to be educational in nature with the client taking an active role in the process. Professional development training in areas such as functional business disciplines, general people skills, basic consulting and computers. New products, services or programs (compared to competitors)	Entrepreneurs receiving counseling for five or more hours	Outsider assistance during the early stages of a venture's development influences its subsequent development, in terms of survival, growth and innovation (as compared to the general population of start-ups).
Zahra et al. (2000)	Outside directors Product, process and organization innovation	Medium-sized (in \$25 to \$500 million asset range) firms	The rate of outside directors in the board of directors is significantly and negatively related to all innovation measures.
Michie &	HR practices	Firms with 50	Firms using more innovative work practices are more likely to innovate

Reference	Independent and dependent variable(s)	Sample	Conclusion
Sheehan-Quinn (2001)	High screening (recruitment and selection); profit sharing and share ownership; individual pay/line incentives; job appraisals; formal induction program for new employees; presence of training for non-managerial employees in the last 12 months; potential to work in teams; high participation; employment security; flexible job assignment; information sharing; influence of consultation; meet union; consultation about change Process or product development	employees or more	(process and/or product innovation).
Barker III & Mueller (2002)	CEO characteristics CEO career experience; age; tenure; educational level; number of business degrees and science/engineering degrees; attainment of legal degree R&D spending	Large publicly traded firms	R&D spending is greater in firms where CEOs are younger and have significant career experience in marketing and/or engineering/R&D. With the exception of advanced science-related degrees (which have a positive and significant impact on R&D spending), they did not find an effect of the CEO's formal education once a CEO attained a college degree.
Laursen (2002); Laursen & Foss (2003)	HR practices Interdisciplinary working groups; Quality circles; Planned job rotation; Integration of functions (e.g. sales, production/service, finance); Delegation of responsibility; Performance pay (not piece work) New products New to the Danish or world market	Firms with 50 employees or more	HR practices are more effective in influencing innovation performance when applied together, as compared to situations in which individual practices are applied alone. The impact of HR practices is higher in knowledge-intensive industries (Laursen, 2002). Firm-internal training and the integration of HR functions have a positive and significant impact on innovation performance (Laursen & Foss, 2003).
Hayton (2003)	HR practices Traditional HR practices; Discretionary HR practices HCM practices Strategic HCM practices; Financial HCM practices Entrepreneurial performance is the ability to innovate, accept risk and identify and exploit entrepreneurial opportunities	Small firms with 100 to 500 employees	The use of strategic HR practices enhancing employee discretionary behavior (offering incentives and mechanisms for exchanging knowledge and encouraging organizational learning) and strategic HCM practices positively influence entrepreneurial performance in SMEs. Interaction effect of HR and strategic HCM variables is negative. The relationships are strongest for SMEs operating in high-technology industries.
Lynskey (2004)	CEO characteristics age, educational background, prior R&D and management experience, networking capacity, whether the CEO is the founder of the firm Number of patent applications in 1998 Number of new products in 1998	Technology-based start-ups	A CEO's educational background and his capacity for networking with researchers are positively related to the number of patent applications in technology-based startups. The CEO's characteristics do not affect new product development.
Subramaniam & Youndt (2005)	Employees' human capital Radical innovative capability : capability to generate innovations that significantly transform existing products and services	Firms with more than 100 employees	Counter to their expectations, employees' human capital has a negative effect on radical innovative capability. This relationship is moderated by social capital, implying that individual knowledge only has a positive impact on radical innovative capability if it is networked, shared and channeled through relationships.
Smith et al. (2005)	Human capital Work experience; formal education; Functional heterogeneity	Large technology firms	Stocks of employee knowledge, measured as educational level and functional heterogeneity, are related to the process of knowledge creation. Next, existing and accessible knowledge in a firm affects the

Reference	Independent and dependent variable(s)	Sample	Conclusion
	<p>Knowledge creating capability (the extent to which employees had access to people or groups with specialized information, were capable of absorbing and combining information that has been exchanged, and anticipated value from the exchange and combination process)</p> <p>Rate of new product/service development</p>		<p>rate of new products and services entirely through the firm's knowledge creation capability. From an organizational perspective, hiring and training well-educated employees with varying functional expertise increases the likelihood that such employees will combine and exchange their ideas to form new knowledge.</p>
Shipton et al. (2006)	<p>HR practices Induction; training; appraisal; contingent reward; team working.</p> <p>Product innovation (new and adapted)</p> <p>Innovation in technical systems (extent to which organizations were committed to innovating across the range of technical (as opposed to administrative) aspects of the business)</p>	Firms between 70 employees and 900 employees	<p>Training, induction, team working, appraisal and exploratory learning focus are all predictors of innovation. Contingent reward, applied in conjunction with an exploratory learning focus, is positively associated with innovation in technical systems. Furthermore, training, appraisal and induction, combined with exploratory learning focus, explain variation between companies in product and technological innovation above and beyond the main effects observed.</p>

First, the majority of articles rely on a sample of established small (e.g. Hadjimanolis, 2000), medium-sized (e.g. Zahra et al., 2000) and large (e.g. Shipton et al., 2006) firms. Only two studies concentrate on entrepreneurs or innovative start-ups (Chrisman & McMullan, 2000; Lynskey, 2004). Yet, innovative newly established firms are considered to be drivers of macro-economic growth since they incite a process of creative destruction (Schumpeter, 1934), keep established firms alert (OECD, 1997), and are more likely to grow as compared to their non-innovative counterparts (De Winne & Sels, 2005). Insights in how different kinds of human capital and HR practices may influence innovation in newly established firms are lacking thus far. Therefore, our study focuses on start-ups. Since we want to be sure that innovation is indeed an objective for the group studied, we only include *new firms aiming at an innovation strategy*.

Second, the concept of innovation has been defined in a number of ways. Some definitions include a whole range of innovations, from administrative or production process refinement to new product/service development (e.g. Hoffman & Hegarty, 1993). Others have a narrow focus, only including new product development (e.g. Laursen, 2002). Several authors focus on input related innovation variables, such as R&D spending (e.g. Barker III & Mueller, 2002), whereas others include output related innovation variables, such as the number of new products/services introduced in the most recent year (e.g. Lynskey, 2004). Finally, Smith et al. (2005) distinguish output variables (the number of new products introduced) from process or throughput variables (the knowledge creating capability). In our study, we focus on *innovation output*. Moreover, we acknowledge the importance of different types of innovation and use a *broad definition of innovation*: ‘organizational innovation is concerned with deliberately designing and implementing incremental or radical changes to an organization’s products/services or processes’ (Hislop, 2005). Thereby we counter the tendency to study only highly innovative or high-tech start-ups (e.g. Lynskey, 2004), a small proportion of the total population of start-ups. Yet, we recognize the difference in degree of risk-taking, by attributing weights to the innovation types concerned (see measures section for more details).

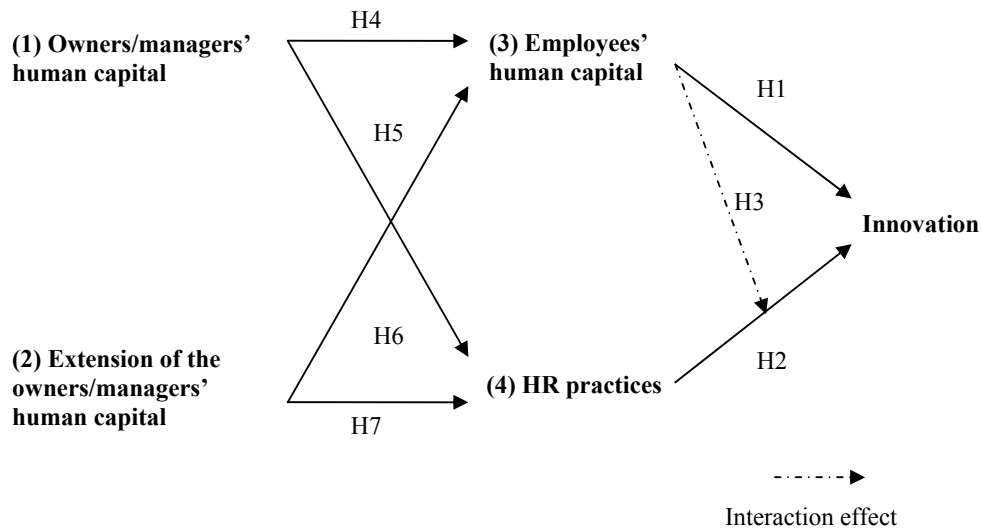
Third, existing literature is fragmented regarding the indicators of human capital and HRM. Some empirical studies exclusively focus on human capital (e.g. Barker III & Mueller, 2002), others on HR practices (e.g. Michie & Sheehan, 1999). Several authors concentrate on the role and human capital of owners/managers (e.g. Lynskey, 2004), whereas other authors only include the role and human capital of employees (e.g. Subramaniam & Youndt, 2005). Only Smith et al. (2005) introduce top managers’ as well as employees’ human capital. Finally, two studies examine the effect of other sources of knowledge on innovation, i.e. external professionals (Chrisman & McMullan, 2000) and independent board members (Zahra et al., 2000). The purpose of this study is to propose a conceptual framework, integrating a broad range of human capital related variables, i.e. the *human capital of owners/managers and employees*, the *appeal to external and independent parties* and *HR practices*.

Finally, the findings are in most cases in line with expectations, indicating that a highly skilled and experienced workforce as well as an intensive human resource management contributes to innovation. Yet, there are some exceptions. Subramaniam and Youndt (2005), for example, found a negative impact of human capital on radical innovative capability. This relationship, however, was moderated by social capital, implying that human capital only incites innovation if it is networked, shared and channeled through relationships. Zhara et al. (2000) found a negative impact of the presence of outside directors on innovation in medium-sized firms. They provide several explanations. They argue, for example, that it is possible that independent directors might rely on data provided by the CEO or other executives. This can limit their influence and increase their dependence on the CEO. Lynskey (2004), in turn, did find a significant effect of the CEO's educational background and capacity for networking on patent application, but not on new product development in start-ups. These mixed results point to the need for further research on interrelationships between HR related determinants of innovation and preconditions under which HR related variables contribute to innovation. We take a first step in this direction by studying the *relationship between the aforementioned HR related variables and innovation in a homogeneous sample* of innovative start-ups between one and two years old, with 1 and 49 employees.

Conceptual framework, theory and research hypotheses

Our conceptual framework and research hypotheses are visualized in Figure 2. As mentioned above, we include four important HR related determinants of innovation: (1) owners/managers' human capital; (2) the appeal to certified experts and independent board members which can expand the knowledge base of the owners/managers; (3) employees' human capital; and (4) HR practices which can influence human capital and sustain processes that contribute to innovation.

Figure 1 Conceptual framework and research hypotheses



Hypotheses

We start with the employee related variables. Employees' human capital refers to the unique set of knowledge, skills and abilities of workers acquired from education and experience (Becker, 1964). It reflects a large part of the stock of knowledge within an organization (Cabrera & Cabrera, 2003; Grant, 1997). Hambrick and Mason (1984) argue that employees' formal education reflects their knowledge bases and cognitive abilities. Therefore, we opt for employees' educational level as a proxy for their human capital and competences enabling them to act in new ways, a necessary condition for innovation (Coleman, 1988; Swart & Kinnie, 2003; Lengnick-Hall & Lengnick-Hall, 2003). According to Smith et al. (2005), education helps individuals to improve their understanding of what they know, to more accurately predict outcomes, to better manage time and resources and to monitor results. In addition, education provides new explicit information and knowledge that greatly influence an individual's cognitive reasoning skills. The authors also refer to the work of developmental psychologists (e.g. Glaser, 1984) supporting the connection between educational level and improved knowledge structures and information processing. Because innovation is considered to be a function of new knowledge (Nonaka, 1991) and because it takes some level of existing knowledge to develop new knowledge (Smith et al., 2005), we expect newly established firms with a higher level of employees' human capital (i.e. a greater knowledge base) to be more innovative than firms with a lower level of human capital. This is in line with previous work. Bontis (1998), for example, considers the quality of the workforce's human capital to be a source of innovation and strategic renewal. Freel (2000), in turn, mentions problems in finding qualified employees as one of the most important barriers to innovation

in small firms. Finally, Smith et al. (2005) give evidence of a positive relationship between knowledge workers' educational level and the firm's knowledge creating capability; a capability that positively influences the number of new products and services. Given the above, we hypothesize that:

H1: The level of the employees' human capital (measured by educational level) is positively related to innovation.

A growing body of research, rooted in the RBV, acknowledges that resources by themselves rarely are a source of competitive advantage (Ray et al., 2004). They are more likely to be so if they are deployed to affect a desired end, i.e. if they are developed through or supported by business processes and management practices (Ireland et al., 2003). Accordingly, human capital can contribute to the firm's innovative capacity, success and viability if it is used effectively (Wiig, 1997).

Grant (1996) defines the primary role of management and management practices as integrating the specialist knowledge resident in individuals into processes, products and services and establishing the coordination necessary for this knowledge integration. Particularly HR practices can play a role in stimulating innovation by sustaining processes of knowledge creation, transfer and integration (Schuler & Jackson, 1987; Shadur & Snell, 2002). *Knowledge creation* on an *individual level* primarily concerns the processing of data and information, resulting in knowledge. Knowledge creation on an *organizational level* concerns tapping the tacit, often highly subjective insights, intuitions and hunches of individual employees and make those insights available for testing and use by the company (Nonaka, 1991, p.97). *Knowledge transfer* refers to passing knowledge, held by individuals, along to others in order for its value to be appropriated and leveraged. From this point of view, knowledge transfer can be a source of new knowledge creation. In order to be effective, the processes of knowledge creation on an organizational level and knowledge transfer should be coordinated and transcend the level of individual competition (Cabrera & Cabrera, 2003). Finally, individual or group knowledge should become organizational knowledge and strengthen the organizational memory (*knowledge integration*) (Walsh & Ungson, 1991). An organization's routines, patterns of behavior, databases and systems may play an important role. Employees can use or rely on them to tackle current problems based on past learned experiences (Shadur & Snell, 2002). Knowledge integration is especially important to anticipate employee mobility and the resulting information or knowledge loss (DeLong, 2004; Haesli & Boxall, 2005). Moreover, firms with a good organizational memory do not have to constantly reinvent the wheel (Shadur & Snell, 2002, p.5).

As mentioned above, processes of knowledge creation and transfer are sources of new knowledge, a necessary condition to enhance chances of identifying and developing new opportunities (Quintas et al., 1997), to improve existing processes, products or services and to develop new processes, products or services (Demarest, 1997). Next, the knowledge base of employees may expand through processes

of knowledge integration. Consequently, they may become more creative and innovative in daily operational tasks and problem-solving (Hansen et al., 1999).

Compared to existing and larger companies, newly formed firms usually work in less planned and formalized ways and cannot afford to establish separate R&D departments. The development, acquisition or transformation of new knowledge in start-ups thus heavily depends on *all* employees. Consequently, the way in which the employees' human capital is developed over time and the manner in which workers are managed are extremely important in newly established firms (Hayton, 2003; Ciavarella, 2003). We thus expect that start-ups with HR practices, facilitating the processes of knowledge creation and transfer and integration, will be more innovative (independent of the level of human capital of the workforce).

H2: The intensive use of HR practices is positively related to innovation.

We assume that the size of the effect of HR practices on innovation depends on the level of employees' human capital; employees with the highest intellectual capabilities will produce the highest returns when leveraged (Hitt et al., 2001). We follow Rauch et al. (2005), stating that employees with higher levels of education have higher intellectual potential to learn and accumulate general knowledge (Hitt et al., 2001) as well as firm-specific skills and knowledge (D'Aveni, 1996). They also make use of HR development more effectively than employees with a low degree of human capital, for example, because they develop better goals and can better contribute to decision making (Rauch et al., 2005). We thus hypothesize that:

H3: The impact of HR practices on innovation is moderated by the level of employees' human capital: the impact of HR practices on innovation will be larger in companies with a higher level of employees' human capital.

In start-ups the owners/managers' human capital is the main source of knowledge needed to select the appropriate resources and effectively build and use the firm's capabilities (Dutta et al., 2002; Reinmoeller, 2004). In accordance with employees' human capital, the human capital of owners/managers is derived from their education and past experience. It is their formal education, exposure to and experience in other organizations that determines the unique set of skills or knowledge base that they bring to the new organization (Boeker, 1997). A consistent finding in research is a positive relationship between the level of education of owners/managers and the receptivity to new ideas and innovation (e.g. Smith et al., 2005). Regarding experience, especially industry experience, findings are less consistent. Prior industry experience may play a prominent role in successful opportunity recognition processes (Hills & Shrader, 1998; Shane, 2000). On the other hand, experienced owners/managers are vulnerable since they may unwittingly stick to manners of working which are commonly accepted in the industry and are less able to grasp new ideas (Hambrick

& Mason, 1984; Ruef, 2002). In general, we expect that the level of the owners/managers' educational level will be positively related with innovation. Because of mixed prior results, we do not formulate a hypothesis on the effect of owners/managers' industry experience on innovation.

However, we assume that the relationship between the owners/managers human capital and innovation is fully mediated by the employee related variables. The main task of owners/managers, especially in a first stage of the firm's life cycle, is to provide a context enabling the firm's strategy (Baird & Meshoulam, 1988; Reinmoeller, 2004). The employees, in turn, carry out the productive and innovative work in the firm. Therefore, we expect that the level of the owners/managers' human capital will be first and foremost visible in the selection and management of human resources (Bergmann Lichtenstein & Brush, 2001; Borch et al., 1999), which in turn influence innovation (cf. H1, H2 and H3). Pursuing an innovation strategy encourages owners/managers to select highly skilled individuals (Schuler & Jackson, 1987). Moreover, aiming for innovation will stimulate owner/managers to develop HR practices sustaining knowledge creation, transfer and integration (Shadur & Snell, 2002). Given the above, we expect that:

H4: The owners/managers' educational level is positively related to the employees' human capital.

H5: The owners/managers' educational level is positively related to the use of HR practices.

Similar to HR practices that can leverage the human capital of employees, practices exist that can be directive for or support owners/managers in the professional management of their firm. Especially the appeal to independent board members (Zahra et al., 2000) and external advice (Chrisman & McMullan, 2004) can expand the owners/managers' knowledge base, thereby increasing the chances of opportunity recognition, management professionalism and innovation.

First, the board of managing directors is considered to be an extension of the strategic decision-making team and can influence, optimize and/or control the decisions of owners/managers in line with organizational strategy. According to agency theory, a strong board of directors is characterized by the presence of independent board members having neither a contractual nor a familial relationship with the firm. Independent board members are less likely to be dominated by the owners/managers and might be less reluctant to take risks and more able to cope with uncertainty, necessary conditions to strive for innovation. Moreover, the independent board members bring different experiences, insights and knowledge to the firm (Conner & Prahalad, 1996). Next, through the introduction of the owners/managers to their social network, independent board members can be useful in gaining access to new knowledge, resources and complementary capabilities that help in augmenting and expanding the firm's knowledge base (Zahra & Filatotchev, 2004). Subsequently, this new knowledge can influence strategic decision-making in favor of innovation, in line with organizational strategy (Zahra, 1996; Zahra et al., 2000). Although research points in the direction of more passive and uninvolved boards in small companies as compared to large firms (Fiegener, 2005), several authors recognize the

importance of the presence of independent board members in entrepreneurial firms (e.g. Bamford et al., 2000).

A second important source of knowledge is outsider assistance or the appeal to external advice. According to Chrisman and McMullan (2004), it is considered to be an instrument through which new ventures obtain a unique blend of tacit and explicit knowledge. The value of expert knowledge is created in two ways. First, the expert brings new knowledge to the organization. Second, outsider assistance may incite a learning process or new knowledge creation. The combination of existing and new knowledge may provide the owners/managers fresh insights. This is especially true during the early stages of firm development, since rigidities constraining application of advice and adaptation are less frequent (Chrisman & McMullan, 2004).

Given the above, we expect that the number of independent board members as well as the number of experts that has been contacted have a positive impact on management decisions, such as the selection of highly skilled employees and the use of HR practices.

H6: The number of independent board members and the number of experts contacted are positively related to the employees' human capital.

H7: The number of independent board members and the number of experts contacted are positively related to the use of HR practices.

Research design

Sample

Data are derived from the START 2003 survey, organized by the Policy Research Center "Entrepreneurship, Enterprises and Innovation" and financed by the Flemish Minister of Economic Affairs. The survey's targeted respondent was the start-up's owner/manager. The population consisted of all Flemish profit companies (1) with 1 to 49 employees and (2) being in their second year of life in September 2003. The survey yielded data for 637 start-ups (a response rate of 29,4%) on various themes, such as upper echelon and employees' human capital, ownership structure, strategy and market orientation and management practices in a wide range of functional areas. The population of start-ups contains both innovative and non-innovative firms. We selected only those firms differentiating themselves from their competitors based on the uniqueness of their production process and products. More specifically, only firms scoring more than average¹ on the *innovation strategy scale* ($\alpha=0.69$)² were selected. Consequently, the likelihood of innovation being an objective for the

¹ The average equals the median in the sample.

² This scale is the result of a factor analysis including items such as 'Our products/services are unique compared to those of our competitors'; 'Our competitors have difficulties to imitate our manner of working'.

group studied (N=294) increases. Finally, a homogeneous sample of start-ups (in terms of age, size and strategic focus) allows minimization of extraneous variation.

Measures

In accordance with OECD/EUROSTAT (1997), we use a broad definition of innovation, including process and product refinement as well as process and product development. *Innovation* is measured by means of an index (*innovation intensity*), composed out of the weighted sum of four dichotomous variables representing achieved innovation projects (weights mentioned between brackets): innovation of supporting processes (e.g. administration) (1), innovation of the production process (2), improvement of existing products/services (4) and development of new products/services (8). The weights are attributed depending on the risk and novelty of the innovation. This allows us to capture both the nature (i.e. output; focus on process or product/service) and the importance (incremental or radical changes, i.e. refinement of existing products/services versus the production of new products/services) of innovative activities. The index ranges from 0 to 15, representing ‘*non-innovators*’ on one end and ‘*full innovators*’ on the other.

Employees’ human capital is measured by the percentage of highly skilled employees (i.e. having a degree of higher education (at least bachelor level)). We assume this measure to be a good proxy of the stock of employee knowledge (Smith et al., 2005). One could argue that we do not measure the competences and knowledge that have been acquired during the employees’ careers. Yet, several studies show that highly skilled employees participate more in training and engage more in lifelong learning compared to unskilled or less skilled employees (Forrier & Sels, 2003). We thus assume that the initial gap in competences and knowledge between unskilled or less skilled and highly skilled employees tends to enlarge during their careers.

The presence of HR practices is measured by means of an index (*HRM intensity index*), consisting in the sum of six binary variables representing six HR practices. Each variable has an equal weight. The index score ranges from 0 to 6 and gives an indication of the extent to which the start-up engages in HRM. Each of the six HR practices can be linked to knowledge creation, transfer and/or integration within the firm, a condition for innovation (Lengnick-Hall & Lengnick-Hall, 2003; Shadur & Snell, 2002). We present some arguments without being exhaustive. The *use of valid selection techniques* gives an indication of the professionalism of the selection process. First, a professional selection process may attract applicants, thereby increasing the number of possible candidates and the freedom of choice of owners/managers. Second, the likelihood to select competent workers is higher if valid selection techniques are used (Schmidt & Hunter, 1998). Finally, the use of valid selection techniques might be a proxy of selective staffing, a variable that has been used in previous research, linking a high performance work system with innovativeness in SMEs (de Kok & den Hartog, 2006). The *organization of training* can optimize the fit between present and requisite domain specific knowledge

and skills (de Kok & den Hartog, 2006). Moreover, it can create an environment supportive of learning, thereby inciting creativity and subsequently innovative activities. The *presence of participation mechanisms* may allow for the discovery, diffusion or utilization of local and tacit knowledge in the organization (Hayton, 2003). This knowledge, in turn, can benefit innovation. *Group-based performance pay* and *appraisal* can both be seen as mechanisms to steer employees' behavior in the desired 'creative or innovative' direction (Lazear, 2000). Moreover, group-based performance pay reinforces collective goals and mutual cooperation, leading to higher levels of trust necessary for knowledge exchanges (Cabrera & Cabrera, 2003). The engagement in *competence management* (with the *explicit purpose of knowledge retention*) points to the presence of a policy aimed at introducing or stimulating activities that can contribute to integration of knowledge within the firm (DeLong, 2004).

Owners/managers' human capital is captured by two continuous variables. They represent observable characteristics often put forward in upper echelon research as reasonable proxies for the knowledge and skill base of central actors and for (underlying differences in) their cognitions, values and perceptions (Barringer et al., 2005; Bosma et al., 2004; Carpenter et al., 2004; Lynskey, 2004): (1) *education*: the share of owners/managers having a degree of higher education (at least bachelor level), and (2) *industry-specific human capital*: the number of years of experience of the owner/manager in the industry in which the firm is active (or the average number of years of industry experience in case of a management team). At first, we also included *entrepreneurship- or leadership-specific human capital* measured by the number of years of management experience of the owner/manager (or the average number of years of management experience in case of a management team). Yet, to avoid multicollinearity (the correlation between industry and management experience proved to be high, i.e. 0.68), we skipped this variable.

Two variables give information on *practices expanding the knowledge base of the owners/managers, thereby influencing their strategic decision-making*: (1) the number of independent board members, and (2) the number of external experts consulted. Independent board members are members of the board of directors without – apart from their membership in the board – any contractual or familial relationship with the firm. External experts are certified advisors. The respondents were asked to indicate whether they obtained expert advice since start-up, and if so, which of the following seven experts they contacted: accountant, lawyer/legist, consultant, bank, employers' federation, government agency or social secretariat.

Four *control variables* are included in the analysis. First, when measuring the impact of HRM intensity, we control for *management professionalism* in other functional domains. Previous studies finding support for a positive relationship between HRM and innovation cannot rule out the alternative explanation of a possible simultaneity of HR practices with activities in other policy areas (Wright &

Boswell, 2002). Management professionalism is measured by an index, consisting in the sum of 7 equally weighted variables. Each variable (1) represents a functional management domain, (2) has a value between 0 and 1, and (3) is a proxy of the extent to which ‘best practices’ in the relevant management domain are used. The policy areas are finance and accounting, strategy, sales, purchase, ICT, networking and marketing. Second, due to potential industry differences in innovative and HR related activities, we control for *sector*. Dummy codes representing seven broad industry categories are created: industry, construction, wholesale & retail, catering, transportation & communication, financial services and health & personal services. Industry is used as our point of reference. Third, we introduce *company size* (number of employees) to control for possible discrepancies between the very small and small firms concerning access to financial means and consequently to innovation and HRM. Finally, since the definition of a start-up is a legal affair, we create a dummy to control for the *company history*. Compared to genuine start-ups (=1), newly established firms resulting from a change in legal statute (=0) could have more experience with employees, HRM and innovative activities.

Analysis

To test the research hypotheses, we use path analysis with manifest variables (Hatcher, 1994). We have chosen this statistical technique for two reasons. First, path analysis enables to define and test theoretically hypothesized paths or relationships between different variables. The output indicates whether the model is supported by the data as a whole and gives a significance test for the various individual paths. Second, a variable in a path model can be both dependent and independent. This allows us to take into account the possible mediating effect of employees’ human capital and HRM intensity. The path model of Figure 2 is tested using the CALIS procedure (SAS).

Following Subramaniam and Youndt (2005), we centered ($\bar{X} = 0$) the employee related variables to minimize the effects of any multicollinearity among the variables comprising our interaction effect. To be sure of the absence of multicollinearity problems after this transformation, we tested the path between innovation intensity (dependent variable) and the transformed employee variables as well as their interaction effect (independent variables) in a simple regression. Two measures guiding us to detect multicollinearity are the variance inflation factor (VIF) and tolerance. The rule of thumb is that $VIF > 4$ and tolerance < 0.20 when multicollinearity is a problem (Menard, 1995; Myers, 1990). The variance inflation factor amounts to 1.10 (HRM intensity), 1.20 (employees’ human capital) and 1.15 (interaction effect). The tolerances equal 0.98; 0.83; and 0.87 respectively.

Results

Descriptive statistics

We start with an overview of the descriptive statistics (Table II). The average score on the HRM intensity index is 2.2, indicating that the average start-up does not use half of the six HR practices mentioned. These results are in line with previous studies in small firms (Sels et al., 2006a; 2006b; Way, 2002). All correlations show the expected sign. In line with previous research (e.g. Ruef, 2002), the correlations between the owners/managers' industry experience and innovation intensity is negative.

Independent variables

We tested the hypothesized model with the CALIS procedure in SAS. The goodness-of-fit measures and the lack of residuals significantly differing from zero indicated that the hypothesized model was successfully supported by the data (Hatcher, 1994). Yet, the modification indices showed that the model could be further optimized by adding an extra path between the number of independent board members and innovation intensity. Since this relationship can be theoretically accounted for, we decided to include it (cf. supra; Zahra, 1996; Zahra et al., 2000). Results of the final path analysis are depicted in Table III. 24% of the variance in innovation intensity is explained by the variables introduced in the model. Moreover, up to 36% of the variance in HRM intensity and 33% of the variance in employees' human capital is explained by the owners/managers' related and control variables. Except for the direct relationship between the number of independent board members and innovation intensity, the results imply that the relationship between owners/managers' related variables and innovation intensity is fully mediated by the employees' related variables.

Table II Descriptive statistics

Variable	Mean	s.d.	(1)	(2)	(3)	(4)	(5)	(6)
1. Innovation intensity	5.41	4.45	1.00					
2. HRM intensity	2.20	1.48	0.28	1.00				
3. Employees' human capital	24.25	37.35	0.22	0.24	1.00			
4. O/M educational level	0.48	0.46	0.13	0.31	0.49	1.00		
5. O/M industry experience	13.68	8.19	-0.08	-0.24	-0.12	-0.12	1.00	
6. Number of independent board members	0.55	1.21	0.14	0.12	0.002	0.20	0.04	1.00
7. Number of experts consulted	3.02	1.49	0.17	0.25	0.11	-0.002	-0.04	-0.03
8. Number of employees	8.42	15.02	0.03	0.22	0.04			
9. Management professionalism	2.64	0.89	0.32	0.45	0.29			
10. Genuine start-up	0.38	0.49						
11. Industry	0.13	0.33						
12. Construction	0.15	0.36						
13. Wholesale & retail	0.29	0.46						
14. Catering (hotels & restaurants)	0.09	0.29						
15. Transportation & communication	0.06	0.24						
16. Financial services	0.20	0.40						
17. Health & personal services	0.07	0.26						

Correlations greater than or equal to 0.13 are significant ($p < 0.05$)

Note: O/M = owner(s)/manager(s)

The impact of HRM intensity (0.12**) and employees' human capital (0.10*) on innovation intensity is positive and significant. Both hypotheses 1 and 2 are thus supported by the data. Next, hypothesis 3 on the interaction effect between HRM intensity and employees' human capital is confirmed as well, stating that the impact of the level of workers' human capital on innovation depends on HRM intensity. To gain insight in the nature of the relationship between HRM intensity, employees' human capital and innovation intensity, we plotted the interaction effect (Aiken & West, 1991) (Figure 2). Unless human capital is 'managed', it provides little benefit to start-ups, in terms of innovation intensity. Moreover, an intensive HRM is more fruitful in start-ups with high human capital as compared to newly established firms with low human capital.

Table III Standardized path coefficients

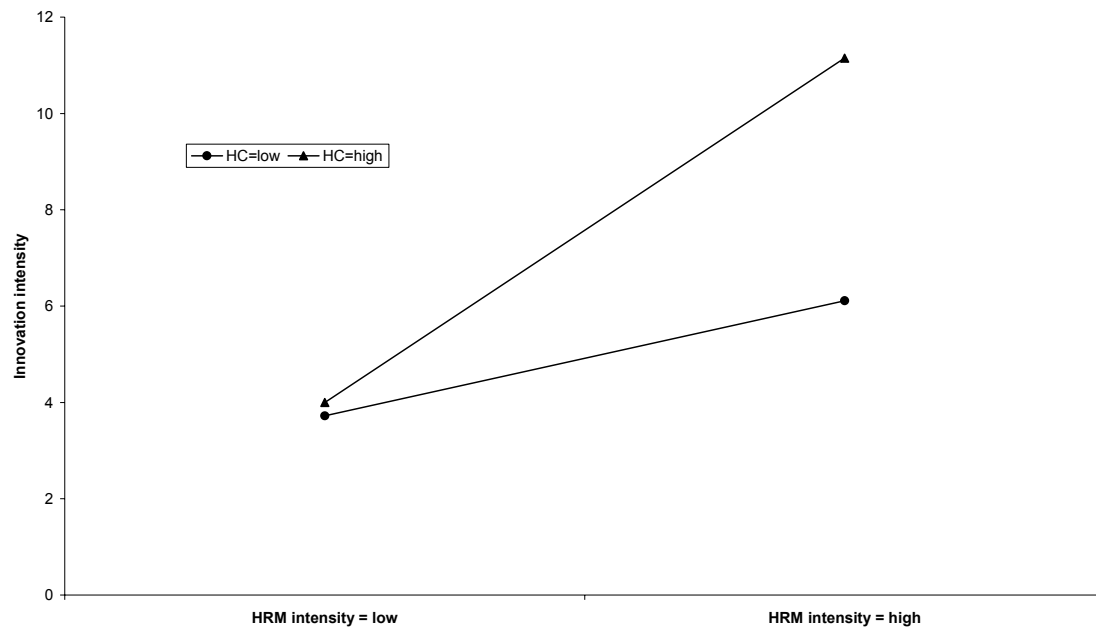
Path from ... to ...	Innovation intensity	HRM intensity	Employees' human capital
Manifest variables			
HRM intensity	0.12**	-	-
Employees' human capital	0.10*	-	-
Interaction	0.10*	-	-
O/M educational level	-	0.15***	0.42****
O/M industry experience	-	-0.20****	-0.05
Number of independent board members	0.11*	0.05	-0.09*
Range of experts consulted	-	0.16***	0.09*
Control variables			
Company history	0.14***	-0.03	0.04
Company size	-0.11*	0.10*	-0.06
Management professionalism	0.24****	0.39****	0.14***
Industry (reference)	-	-	-
Construction	-0.28****	-0.002	-0.03
Wholesale & retail	-0.24***	-0.05	0.03
Catering	-0.03	0.04	-0.12**
Transportation & communication	-0.15***	-0.01	-0.03
Financial services	-0.26***	0.02	0.13*
Personal & health services	-0.13**	0.14***	-0.01
Squared multiple correlations	0.24	0.36	0.33

O/M = owner(s)/manager(s)

p < .10; ** p < .05; *** p < .01; **** p < .001

Goodness-of-fit: Chi-square (p-value) 0.96; Goodness of Fit Index (GFI) 0.99; Bentler's Comparative Fit Index 1.00; Bentler & Bonett's Non-normed Index 1.13

Figure 2 Interaction effect between human capital and HRM intensity



We hypothesized that the owners/managers' related variables do not have a direct impact on innovation. Instead, we assumed that they manifest themselves in the recruitment of a highly skilled workforce and the use of professional employee management practices which, in turn, boost

innovation. The educational level of the owners/managers and the number of experts consulted have a positive influence on the selection of highly skilled employees and HRM intensity. This is in line with our expectations. Next, industry experience has a significant negative impact on HRM intensity and subsequently negatively influences innovation intensity. Finally, the number of board members has a significant negative impact on employees' human capital and a positive and direct effect on innovation intensity.

Table IV gives an overview of the total effects. HRM intensity, employees' human capital and the number of board members have a positive and direct impact on innovation. Owners/managers' educational level and the range of experts consulted have positive total effects on innovation. Yet, they influence innovation indirectly through their impact on employees' human capital and HRM intensity. Finally, industry experience has a negative total effect.

Table IV Direct, indirect and total effects of HR related variables on innovation intensity

Variable	Direct effects	Indirect effects ^(*)	Total effects ^(**)
Employees' human capital	0.12	-	0.12
HRM intensity	0.10	-	0.10
O/M educational level	-	0.06	0.06
O/M industry experience	-	-0.03	-0.03
Number of independent board members	0.11	-0.005	0.11
Range of experts consulted	-	0.03	0.03

(*) Indirect effects are calculated through a combination of summoning and multiplying direct effects. The indirect effect of the number of independent board members on innovation intensity is the product of the negative direct effect of the number of independent board members on employees' human capital (see Table III; -0.09) and the positive direct effect of the number of independent board members on HRM intensity (0.05): $(-0.09) * 0.05 = -0.005$.

(**) Total effect = direct effect + indirect effect

Control variables

Management professionalism plays a clear-cut role. It shows a positive relationship with innovation, HRM intensity and employees' human capital. Nevertheless, the impact of HRM intensity remains significant, even in firms well managed in other functional domains. In line with previous research in small firms, we find a positive impact of size on HRM intensity (Kaman et al., 2001) and a negative impact of size on innovation intensity (Bower & Christensen, 1995). De novo or genuine start-ups seem to be more innovative as compared to start-ups with a longer history. Finally, industry is the most innovative sector.

Discussion and suggestions for future research

Conclusion

The results indicate that owners/managers' human capital, employees' human capital and HR practices significantly contribute to innovation in start-ups (research question 1). First, employees' human capital and HRM intensity have a strong and positive effect on innovation intensity. Yet, unless human capital is 'managed', it provides little benefit to start-ups, in terms of innovation intensity. Moreover, an intensive HRM is more fruitful in start-ups with high human capital as compared to newly established firms with low human capital. Second, the owners/managers' educational level and the appeal to external experts indirectly affect innovation, through the selection of highly skilled workers and/or the development of an intensive HRM system. The owners/managers' industry experience has an indirect negative effect, whereas the number of independent board members directly and positively influences innovation. The findings largely confirm the hypothesis that employees' human capital and HRM intensity mediate the relationship between owners/managers' (extended) human capital and innovation (research question 2). Only the direct relationship between the number of independent board members and innovation intensity does not match this hypothesis.

The impact of owners/managers' industry experience is negative. The owners/managers of the start-ups in the sample stated to have at least the intention to be innovative. This negative effect can thus not be ascribed to the often suggested explanation that older and more experienced owners/managers lack the willingness to innovate or to take risks (Hambrick & Mason, 1984). We thus assume that experienced owners/managers are vulnerable since they may unwittingly stick to manners of working which are commonly accepted in the industry and are less able to grasp new ideas (Hambrick & Mason, 1984). People with a background in other industries may be more creative and therefore more successful in terms of innovative output. Moreover, in the case of a group of owners/managers with experience in the same industry, they may act as if they have a monopoly of knowledge in the field, which can sometimes lead to the rejection of good and new ideas (*'not invented here syndrome'*; Katz & Allen, 1982).

In summary, the study learns that a combined strategy of valuing and managing human resources in start-ups can significantly strengthen the innovation performance, thus stimulating their chances of building a viable business model and safeguarding future growth and further development (Barringer et al., 2005; Freel & Robson, 2004). Next, the results stress the pivotal role played by owners/managers in start-ups and provide evidence of the importance of mechanisms expanding the owners/managers' knowledge base. Especially in the case of owners/managers with a lot of experience in one industry, being surrounded by experts and managers with experiences in other domains might benefit.

Contributions

Our findings contribute to different research streams. First, we contribute to *entrepreneurship literature*. Thus far, consequences of innovative activities in start-ups (in terms of their contribution to survival, success or growth of the firm) have been studied more frequently than determinants of innovative activities in start-ups. Moreover, insofar determinants have been studied, it only concerned owners/managers' characteristics (e.g. Lynskey, 2004). This study shifted the focus towards several human capital related determinants and their interrelationships in examining innovation.

Second, our contribution to *upper echelon research* is twofold. Our findings enrich previous work by uncovering the paths (black box) through which upper echelon related variables influence innovation. Mainstream upper echelon models examine the direct effect of upper echelon characteristics on innovation. According to the results, it seems more likely that upper echelon characteristics are visible in the management of crucial resources. Subsequently, they indirectly contribute to innovation. Next, traditional upper echelon models only focus on the owners/managers' characteristics. The findings show that mechanisms to support owners/managers in their decision-making or actions, such as the appeal on expert advice and independent board members, are equally important to stimulate management professionalism and innovation.

Finally, we add to *HRM-performance research* in several ways. Following the resource based view of the firm, we made a clear distinction between human resources and the strategic management of human resources and studied the interplay of both factors in influencing innovation. Next, we integrated upper echelon and lower echelon related indicators in one conceptual framework. Hence, we recognize the role of the owners/managers in valuing, selecting and managing human resources in start-ups. Moreover, examining both the impact of the upper echelon related variables on the selection and management of employees as well as the effect of lower echelon related indicators on innovation, we combined research on the creation and the effect of HR related variables. We also controlled for management professionalism in other functional domains. Doing so, we accounted for the possible simultaneity between several best practices influencing innovation and measured the pure effect of HR related variables. The positive and significant impact of management professionalism on innovation intensity indeed shows that this control variable is needed. Finally, we studied newly established firms, a group that has been overlooked in the past.

Implications and limitations

The findings stress the importance of a combined strategy of attracting a valuable workers pool and an intensive human resource management in achieving innovation in start-ups. Yet, this might be difficult to achieve for start-ups. First, approximately 52% of the firms in our sample indicate that they have plans to expand in the next year. Moreover, 57% of these expanding firms state that they (will) have problems to find qualified workers. Attracting and retaining employees is one of the main problems for start-ups since they lack legitimacy on the labor market and lack financial means to compete with

the attractive terms of employment in larger firms (Cardon & Stevens, 2004). Yet, according to Marchington et al. (2003), a lack of qualified employees is a threat to expansion in the short run, but may be a serious threat to continuity of the business in the long term. A minimum of HR investments is thus needed to recruit enough applicants, a necessary condition to be able to choose valuable employees. This might be good news, since an intensive HRM is not only fruitful in attracting employees, but also in terms of innovation intensity. However, despite evidence of positive effects, the introduction of HR practices also entails costs (Sels et al., 2006a). Especially in start-ups, the implementation of HR practices may endanger the – often weak – liquidity position in the short run (i.e. the ability to settle short-term debts). From an economic point of view, investing in more sophisticated HR practices is only justified if it pays off in the long term. Although we did find a positive relationship between the selection of and investment in highly skilled workers and innovation, we do not know which impact these HR related investments have on a start-up's financial health. Moreover, we did not assess the effect of the financial investments accompanying attempts to strengthen the innovative capacity on firm performance. Future research might want to consider HR investments, innovative capacity and financial performance in one conceptual framework in order to map out the positive (i.e. value-creating) and negative (i.e. cost-increasing) effects caused by HR investments. As newly established firms are often confronted with liquidity problems, an insight into the complex trade-offs between HR investments and HR benefits could be fruitful for new business managers.

According to the results, the presence of an intensive HRM and a highly skilled workforce depend on the owners/managers' appeal to experts. We assumed that knowledge gained during the early stages of firm development is applied more easily since rigidities constraining adaptation are less frequent (Chrisman & McMullan, 2004). These results point in this direction. Yet, contrary to the positive impact of external experts' advice, we did not find an impact of the number of independent board members on the presence of an intensive HRM. Moreover, the presence of independent board members negatively influences employees' human capital. We assume that technical advice is effective in professionalizing management, whereas the contribution and experience of independent board members is more fruitful in terms of opportunity recognition (which would explain the direct positive impact of independent board members' presence on innovation intensity). Future research might want to zoom in on the role and impact of different kinds of advice in start-ups. Moreover, it is possible that the impact of advice differs in different stages of a firm's life cycle. Professional advice of external experts in a later stage, for example, can be beneficial since external parties will be more open-minded and less resistant to radical propositions. However, it can be less fruitful once management practices are more complex and idiosyncratic – thus resistant to change – due to path dependency.

The results also have implications for new business managers and government policy. The findings imply that owners/managers of start-ups should have access to knowledge on human resource management; be it through education, affordable advice or experience of other managers. First, the owners/managers' education plays a pivotal role. In educating (potential) entrepreneurs, three components are important: (1) teaching professional expertise and knowledge, (2) sharpening behavioral competences such as creativity, perseverance and the ability to act independently and (3) creating transfer possibilities between learning context and practice (Sels, 2005). Whereas the first two issues are mainly the responsibility of the educational system, the last one is a shared responsibility of educational institutes and the business community. In realizing the objective of becoming a dynamic and competitive economy, all parties will have to take their responsibilities. The awareness of a collective responsibility in stimulating successful entrepreneurship has been growing recently. In 2003 a conference has been organized by the Flemish government (Ondernemingsconferentie, 2003), resulting in a declaration of intent to stimulate entrepreneurship in Flanders. One of the most important cornerstones in this declaration of intent is the forward-looking emphasis on the enhancement of creativity through education and training, and stimulation of research and development and personal initiative. New business managers, on the other hand, should be aware that intuition alone may not be sufficient. Too often, they suffer from the omnipotence and omniscience syndrome (Carroll et al., 1999; Churchill & Lewis, 1983).

Second, the *appeal to external advice* is fruitful for the development of an intensive HRM. This finding points to the necessity of affordable and accessible professional advice for new business managers. Formulas such as mentorship of new business managers or policies on subsidies for advice have been recently introduced and stimulated, which is a step in the right direction. This kind of initiatives, however, should be supported by effective information campaigns. Thus far, it happens too often that these subsidies do not reach new business managers.

Third, the *configuration of the governance system (board of directors)* is important as well. The number of independent board members has a positive impact on innovation intensity. This confirms the agency perspective stating that a strong board can optimize decisions or actions of the owners/managers in order to align them with the long-term objectives. In the first stage of a firm's life cycle, corporate governance is not yet a strong formalized structure, but rather an attitude. This attitude makes the owners/managers more sensitive to issues such as control, transparency, representation and advice. Neglecting these issues can cost the firm dearly, both in the short run and the long run (e.g. a lack of professionalism in management practices and subsequently a decrease of survival chances). New business managers should be made aware of the importance of these issues. On the other hand, experienced top managers in large or established firms should be stimulated to provide promising start-ups with their advice.

We end with some limitations of this study. A first limitation concerns our selection of HR practices. Although all selected practices are somehow related to processes of knowledge creation, transfer and integration and subsequently to innovation, the indicators could be refined. HR practices are measured on a general level, for example the presence of training. In future research we will measure more specific HR practices, such as the presence of training in problem-solving skills. Moreover, the extent to which the HR practices are introduced with the sole purpose of enhancing the firm's innovative capacity could be assessed. Second, our narrow focus on Flemish start-ups inhibits generalizations of our findings towards start-ups in other countries, but also to larger and/or older firms. Regarding the latter group, their easier access to financial means, history and the higher number of employees could all have an impact on the variables – and the interrelationships between them – introduced in our model. As mentioned before, life cycle models could prove very useful to gain insights in how these interrelationships change over time. Third, because of a lack of secondary databases with innovation performance indicators for the firms in our sample, we only relied on one informant to collect HR related and innovation data. This causes a common method problem which might have influenced the findings. Finally, the introduction of time lags would be beneficial because it may take time before the impact of HR practices on innovation becomes visible. It is our intention to follow up the firms in our sample and include longitudinal data in future analyses.

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