Richard Lacoursière, Bruno Fabi, Louis Raymond[*]

Configuring and Contextualising HR Systems: An Empirical Study of Manufacturing SMEs[**]

Human resource management (HRM) has become for SMEs a critical factor of adaptation to an increasingly complex and uncertain business environment. Founded on open systems and contingency theory, the present study seeks to identify configurations of HR systems in manufacturing SMEs, and to determine the extent to which these configurations are associated to the environmental and organisational context. Survey data analysis of 176 manufacturing SMEs revealed three configurations of HR systems, namely a "strategic-high-commitment system", a "functional-high-commitment system", and a "traditional-low-commitment system". Differences in these systems are associated to variables that reflect the SMEs' environmental, organisational and technological context.

Key words: **HRM, gestalts, open systems theory, context, small business**

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[*]   Richard Lacoursière, M.Sc., Université du Québec à Trois-Rivières, 3351, boulevard Des Forges, Trois-Rivières (Québec), Canada – G9A 5H7, phone: 819-376-5011, ext. 4047, e.mail: richard.lacoursiere@uqtr.ca.

Bruno Fabi, Ph.D., Université du Québec à Trois-Rivières, e-mail: bruno.fabi@uqtr.ca.

Louis Raymond, Ph.D., Université du Québec à Trois-Rivières,
e-mail: louis.raymond@uqtr.ca.

Introduction

One of the important trends in the study of organisations in the last thirty years has been the increasingly explicit recognition of environmental factors, including the study of HRM in SMEs (Arthur/Hendry 1992). For Scott (2004), this is attributable to the development of open systems theory, focusing on the environment with which all types of systems interact, be it the cell or the solar system, or in which they operate and evolve. This theory has given rise to various theoretical approaches aimed at explaining the determinants of organisational structure, including contingency theory (Woodward 1958; Lawrence/Lorsch 1967), transaction cost theory (Williamson 1975, 1985), resource dependency theory (Pfeffer/Salancik 1978), network theory (White/Boorman/Breiger 1976), population ecology (Hannan/Freeman 1977) and institutional theory (DiMaggio/Powell 1983; Meyer/Rowan 1977). Each approach has developed new arguments to explain how certain environmental factors interact with and affect organisations.

Being in close proximity to their business environment, small and medium-sized enterprises (SMEs) in particular must continuously adapt themselves to the pressures and constraints that emanate from this environment (Freel 2000). As well, these firms must be flexible in managing internal changes pertaining to their resources (human, technological, financial) and their organisation (e.g., changes in size, stage of development, production system) (Harney/Dundon 2006).

In adapting to changes in their internal and external environments, SMEs must make all sorts of adjustments, especially with regard to their HR systems. The manner in which these adjustments are made has given rise to an important body of literature characterised by a divergence between those researchers that have adopted the universalistic perspective and those advocating the contingency perspective. The universalistic perspective posits that the most-recognised HR practices have a positive effect whenever they are applied. Thus, simply applying one or more practice is deemed to directly and positively influence organisational performance. This approach has also been labelled as "best practices" and "one best way" (Delery/Doty 1996; McMahan/Virick/Wrigth 1999; Colbert 2004).

The contingency perspective suggests however that HRM practices are effective to the extent that they are "aligned" with the business strategy (Miles/Snow 1984; Schuler/Jackson 1987). As discussed by Venkatraman (1989), various forms of alignment or "fit" are possible, including "gestalts" whereby fit is seen as a set of relationships that are in a temporary state of balance (Miller 1981). Another assumption is equifinality, which recognizes that numerous equally effective gestalts may exist (Van de Ven/Drazin 1985). The configurational perspective, at times distinguished from the contingency perspective in HRM research (Delery/Doty 1996), is taken here to be similar to the latter perspective as it is not really distinguishable from a conceptual point of view (Schuler/Jackson 2005).

Both the universalistic and contingency perspectives have been the object of criticism, the first mainly for being too simplistic, the second because it most often considers only one contingency variable, that is, strategy. Moreover, as mentioned by Purcell (2004, in Paauwe and Boselie 2005: 74), there is very little empirical evidence

to justify associating HRM practices to the firm's strategy, especially when this strategy is defined in general terms such as innovation, quality and cost reduction.

Surveying the recent literature, one denotes repeated calls for a more systemic approach to HRM. This preoccupation applies at two levels. First, with regard to HRM practices, it would seem more appropriate to analyze them as coherent sets of practices rather than individually (Arthur/Boyles 2007), i.e., researchers are called upon to study HR system configurations. Second, with regard to HRM systems, these should be analyzed within the specific environmental, organisational and technological contingencies of their implementation, i.e., researchers should study the contexts in which HR systems are developed (Harney/Dundon 2006; Paauwe/Boselie 2005; Schuler/Jackson 2005). The present study thus seeks to identify configurations of HR systems in manufacturing SMEs, and to determine the extent to which these systems are contingent upon their environmental and organisational context of implementation. A variety of definitions of an SME are applied among OECD countries. For the purpose of this paper, SMEs are considered to have an upper limit of 250 employees, as in the European Union (OECD 2005). Although they account for over 95% of manufacturing enterprises and that in most economies they generate two-thirds of private sector employment (OECD 2005), SMEs have been treated as "second-class" citizens in the HRM literature and there is a need to develop additional research (Tansky/Heneman 2003).

Conceptual framework

Configuring HR systems

A number of strategic HRM researchers have placed the emphasis on analyzing HR practices as a whole within the organisation, i.e., on studying the organisation's HRM "system" rather than its individual HRM practices. The reason invoked is that on a theoretical basis, this notion presents a greater explanatory potential when analyzing the impact of HRM on individual and organisational performance (Arthur/Boyles 2007; Becker/Gerhart 1996). In this regard, previous empirical studies have found that large firms implement HRM systems that emphasize, to a varying degree, practices meant to increase the commitment of employees. One of the first of these studies was Arthur's (1994), distinguishing between HRM systems of the "control" and of the "commitment" type. Other researchers have also talked of "high-involvement work systems" (Lawler 1992; Benson/Young/Lawler 2006) "high performance work systems" (Huselid 1995), "HR sophistication" (Koch/McGrath 1996), "traditional" versus "innovative" (Ichniowski/Shaw/Prennushi 1997), or "traditional" vs "discretionary" (Hayton 2003) HR systems. It is clear from such studies that certain large enterprises invest more than others in HRM practices linked to the acquisition, training, information, motivation, and participation of employees, i.e., they implement "high-commitment" systems. Fabi, Raymond and Lacoursière (2007) arrived at a similar conclusion with a sample of SMEs. Guthrie (2001) adds that firms are more susceptible to implement these types of HRM systems when employees are perceived a source of competitive advantage that is difficult to replace; inversely, firms that consider employees to be easily replaceable invest less in these practices.

In the context of SMEs, to our knowledge, no attempt has yet been made to verify if these firms can be empirically typified in terms of the HRM systems that they have implemented and in terms of "high-commitment" systems in particular. This is not surprising however, given Tansky and Heneman's (2003) review of HRM research in entrepreneurial firms, concluding on the need for researchers "to focus on the area of SMEs by doing descriptive research, developing taxonomies or frameworks, developing theory, and actually testing the theory in the field".

Contextualizing HR systems

Surveying the recent literature, one also denotes repeated calls for a holistic approach to HRM (Edwards/Ram/Gupta/Tsai 2006; Harney/Dundon 2006; Marlow 2006; Martin-Alcazar/Romero-Fernandez/Sanchez-Gardey 2005; Paauwe/Boselie 2005; Rowley/Abdul-Rahman 2007; Schuler/Jackson 2005). The researchers making such calls generally insist on the need to consider various contextual elements that may influence or even constrain HRM choices. Systemic approaches assume however that a large number of variables be taken into account, and that these variables may interact in non-linear fashion. The interest of such approaches lies more in their capacity to enrich one's understanding of the interrelationships among the variables present, both within the system and in the environment, rather than in establishing cause-effect relationships (Mathews/White/Long 1999; Truss 2002).

Regarding SMEs, a number of empirical studies have attempted to identify the determinants of HR systems or practices, and of the formalisation of such practices in certain cases (see Appendices 1 and 2). The three factors most analysed have been organisational size with 23 studies, business strategy with 16 and presence of a labour union with 12. Studied less frequently are factors such as the characteristics of the owner-manager, the power of customers, the firm's stage of development and technology, the characteristics of the labour force, and the presence of a HR manager. A summary of the results obtained in this regard follows.

Organisational size. The size of firms is seen to influence both the diversity of HRM practices and the degree to which they are formalised (Bacon et al.1996; Heneman/Berkley 1999; Kotey/Slade 2005; Wagar 1998). The designation of a HR manager is made when the number of employees reaches approximately one hundred (Baron/Hannan/Burton 1999).

Business strategy. SMEs that focus on innovation and quality tend to invest more in certain HRM practices linked to recruitment, training, performance appraisal, consultation and incentive compensation (Aragón-Sánchez/Sánchez-Marín 2005; Bayo-Mariones/Merino-Diaz de Cerio 2004; Sanz-Valle/Sabater-Sánchez/Aragón-Sánchez 1999). However, studies that attempt to associate specific HR practices to pre-defined strategic profiles, for instance the Prospector, Analyzer or Defender profile in Miles and Snow's (1978) typology, have obtained mitigated results (Peck 1994; Raghuram/Harvey 1994).

Presence of a labour union. Studies seeking to determine the impact of a labour union presence upon the application of one or more HRM practice have obtained divergent results. While some have found a positive effect (Chowhan 2005; Turcotte/Léonard/Montmarquette 2003; Wagar 1998) or did not find any effect (Bayo-Mariones/Me-

rino-Diaz de Cerio 2004; Knoke/Kalleberg 1994; Machin/Wood 2005), others found a negative effect (Kok/Uhlaner 2001; Shah/Ward 2003).

Owner-manager characteristics. Due their preponderant role within the organisation, SME owner-managers or entrepreneurs tend to structure their firm's HR system in relation to their own individual characteristics (e.g., their age, gender and education), values and beliefs (e.g., their management philosophy) (Bacon et al. 1996; Baron/Hannan/Burton 1999; Matlay 1999; Mazzarol 2003; Verheul/Risseeuw/Bartelse 2002).

Power of customers. When doing business with a limited number of customers or with prime contractors, SMEs must implement practices or adopt new ways of doing that are more or less imposed by these customers. Thus, customer exigencies, notably with regard to product quality and time of delivery (just-in-time), are seen to force SMEs to intensify their employees' training and to revise their work-organisation mode (Beaumont/Hunter/Sinclair 1996; Kinnie et al. 1999; Swart/Kinnie 2003).

Stage of development. The needs of SMEs with regard to HRM can depend upon the stage of development at which they have arrived. Their size notwithstanding, these firms can face different priorities if they are at the start-up, expansion, consolidation or diversification stage (Budhwar/Khatri, 2001; Hanks/Chandler, 1994; Leung, 2003; Rutherford/Buller/McMullen 2003; Society for Human Resource Management 2002).

Technology. The technology used by SMEs can incite them to further develop certain HR practices. It has thus been observed that the more firms implement advanced manufacturing technologies and a quality management approach, the more they are apt to provide training and implement practices that favour employee participation (Bayo-Mariones/Merino-Diaz de Cerio 2004; Chowhan, 2005; Poutsma/Hendrickx 2003; Turcotte/Léonard/Montmarquette 2003).

Presence of a HR manager. It seems quite evident that the presence of a manager dedicated to the HR function would influence the firm's HR system development. The presence of a designated supervisor of HR activities allows the firm to plan better, diversify and formalise practices such as recruitment, selection, information, training and performance appraisal (Heneman/Berkley 1999; Way/Thacker 2004).

In an effort to better understand the forces affecting HRM in SME's, Arthur and Hendry (1992) proposed a model in which they identified five major factors likely to influence HRM activity: human resource supply, product-market structure, industry sector, ownership, and SMEs' infrastructure. More recently, Harney and Dundon (2006) supplemented this model by distinguishing between external influences (e. g. product-market structure, HR supply, industry sector, technology) and internal dynamics (e. g. SMEs' infrastructure: ownership, size, trade union presence). As denoted by Harney and Dundon (2006: 53), the aim of their study was not to identify patterns or profiles of HR systems within their sample, but rather to better understand the motives for which certain choices were made. In analysing six case studies, these authors found HR practices to be determined by a complex interaction of internal (organisational) and external (environmental) factors, concluding that HRM was reactive rather than strategic. Other researchers have arrived at similar conclusions with regard to the HR practices of SMEs (Cassel et al. 2002; Edwards et al. 2006; Katz et al. 2000), lead-

ing one to believe that in such a research context, an open systems (reactive) approach to the analysis of HRM would be more appropriate than other approaches (e. g. contingency, resource-based view) that are more analytical and presume a level of HR expertise attained by few SMEs.

The theoretical and empirical literature thus clearly indicates that many contextual – external and internal – factors can influence the HR system configuration in SMEs and that an open systems approach could be particularly useful in analysing the complex interplay of these factors. Based on the framework proposed by Harney and Dundon (2006), the present study has a complementary aim in determining if one can observe and explain the existence of different configurations of HR systems specific to manufacturing SMEs, given an internal and external context that can bear upon the adoption of these systems. More precisely, this research will attempt to answer the two following questions:

1. What are the HR system configurations that characterize manufacturing SMEs?
2. To what contextual elements of the SMEs' external and internal environment are these configurations associated with?

The research model is presented in Figure 1. It includes on one hand a number of external and internal contextual variables, and on the other hand the HR system configurations that are specific to manufacturing SMEs on the basis of their development of certain HR practices.

Figure 1: Open systems framework of factors influencing HR system configuration in SMEs (adapted from Harney/Dundon 2006)
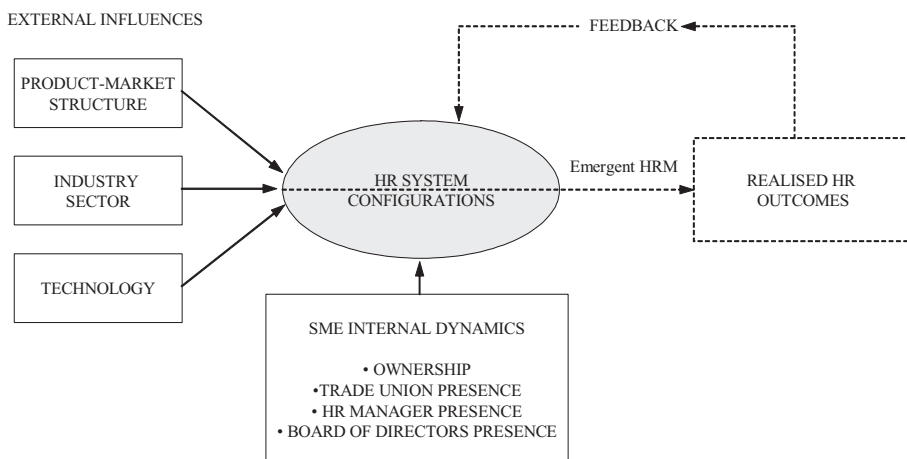
Research Method

The required data on the HR practices and context of SMEs were obtained from the database of the PDG®, set up by a university research center, in association with an 800-member industry association. This database contains information on more than 300 Canadian manufacturers, including more than 850 general and financial variables, obtained

from a survey questionnaire to which the respondents append their firm's financial statement for the last five years. The firms are directly contacted to provide this information in exchange for a comparative diagnostic (benchmarking) of their overall situation in terms of performance and vulnerability. The data collection process insures that the data entered into the database are valid (for added information on the diagnosis system and on data collection and validation, see St-Pierre/Delisle 2006). Firms with less than 20 and more than 249 employees were eliminated in order to obtain a sample of organisations whose size conforms to both the European (e.g., Kalantaridis 2004: 249) and North American (e.g., Mittelstaedt/Harben/ Ward 2003: 71) definitions generally used in research on SMEs. This led to a sample of 176 enterprises whose size varies between 20 and 233 employees, the median being 50. More than fifteen manufacturing sectors are represented, including metal products, wood, plastics and rubber, electrical products, food, and machinery. As such, the firms in the sample seem fairly representative of Canadian manufacturing SMEs in terms of size and sector (Industry Canada 2005).

Measures

The four contextual constructs in the research model are measured with fourteen variables. The SME's *product/market structure* is ascertained by the level of commercial dependency (power of customers), that is, the percentage of sales attributed to the three largest customers (Freel 2000), by the level of product development, as measured by the ratio of the R/D budget to annual sales, by the level of market development, as measured by the percentage of annual sales exported, and by the level of network development, as measured by the number of partnerships entered into by the firm with its customers, suppliers, and other business partners for purposes of procurement, design and R/D, production, distribution, and marketing (Bayo-Moriones/Merino-Diaz De Cerio 2004; Kalantaridis 2004; Sohal/Perry/Pratt 1998).The *sector* is measured by the level of technological intensity associated to the industry in which the firm operates (as classified by the OECD) (St-Pierre 2002). Manufacturing *technology* is apprehended by the presence of quality standards and by the extent to which three types of advanced manufacturing technologies are assimilated in the firm, namely product development technology (for innovation, e.g., CAD), manufacturing process technology (for flexibility, e.g., FMS), and planning/logistics technology (for integration, e.g., ERP) (Kotha/Swamidass 2000). The *internal dynamics* variables include the chief executive's (owner/manager) characteristics as measured by the level of education and level of experience in the industry, and three dichotomous measures, the presence of a board of directors, of a labour union, and of a designated HR manager. Note that one element of the structural context, namely the presence of a board of directors, has been included in the research model even though it has not been previously linked to the HRM behaviour of SMEs. This added relationship is founded on institutional theory, on previous empirical evidence of the impact of a board of directors on the SME's strategy (Huse 2000), and on the role played by the board in its counselling and advisory capacity (Johannison/Huse 2000; Van den Heuvel/Van Gils/Voordeckers 2006). A control variable, organisational size, is measured by the number of employees.

The development level of HR practices in SMEs was measured by ascertaining the extent to which the following ten practices are applied: job descriptions, recruitment, performance appraisal, incentive compensation (profit sharing and stock ownership), employee participation, information sharing (strategic, economic and operational information), and training. Following Boselie, Dietz, and Boon (2005), each practice was measured by its coverage (the employees to whom it is applied) or by its intensity (the degree to which it is applied). The application of the first five practices was thus measured by counting the number of personnel categories (managers, office workers, sales representatives, foremen, production employees) covered by it (0 to 5). The intensity of consultation was measured by evaluating to what extent production employees are consulted with regard to operations management decisions (1 = informed after the fact, 2 = informed before the fact, 3 = consulted, 4 = partners in decision-making, 5 = mandated to make decisions). The extent to which employees are informed is measured by the nature of the information communicated by managers to employees, there being three types of information (strategic, economic, operational) with three to six indicators for each type, this information being potentially communicated to four personnel categories. There were thus four indicators of the strategic information communicated, three for economic information and six for operational information. Training intensity was measured by the ratio of the firm's training budget over its annual sales.

Results and Discussion

As most appropriate to examine HRM from a contingency or "gestalts" perspective (Venkatraman 1989), the cluster analysis technique was used to identify different HR systems of the sampled SMEs with regard to the development of HRM practices. This numerical taxonomic approach first aims to group organisations into clusters such that each cluster's membership is highly homogeneous with respect to certain attributes. Here, the attributes (or clustering variables) are the ten HR practices. A second aim is that each group differs from other groups with respect to these same characteristics. The SPSS TwoStep clustering algorithm was used as it can handle a large number of cases and automatically determines the optimal number of clusters. A three-cluster solution was found to be most parsimonious in identifying groups of firms that could be clearly distinguished from one another, based on a meaningful pattern of relationships among the clustering variables. These three groups were labelled as representing respectively a "traditional-low-involvement" (n = 71), a "functional-high-involvement" (n = 75), and a "strategic-high-involvement" (n = 35) HR systems. One should recall at this point that this constitutes a taxonomy rather than a typology of the HR systems of manufacturing SMEs, to the extent that these profiles are determined *a posteriori* and were not theorised *a priori* (Miller 1996).

Configuring HR systems in manufacturing SMEs

Pertaining to the first research question, the means of the clustering variables for each of the three clusters are presented in Table 1. One-way analysis of variance (ANOVA) was used to evaluate the equality of variable means across the clusters and thus assess the distinctiveness of each derived cluster. Given that size was found to be an important predictor of HRM practices (Barrett/Mayson 2007; De Kok/Uhlaner 2001; Ko-

tey/Sheridan 2004; Ng/Maki 1993), controlling for this variable would increase the validity of the clustering results. The ANOVAs were thus repeated with size as a covariate in order to control from the possibly confounding effect of this variable. No such effects were found. F-tests confirm that these means differ significantly across the three groups for all clustering variables. Added tests of significance of pairwise contrasts (Tamhane's T2 test) indicate certain similarities however.

In looking at a first group of SMEs, namely those that exhibit a *traditional-low-involvement* HR system, one finds the mean coverage or intensity of each of their HRM practices to be significantly inferior to the other two groups. These firms show the least developed HR systems, meaning that HR practices, when implemented, are targeted to a limited number of personnel categories. They thus constitute the weakest in terms of applying HR practices thought to enhance employees' level of ability (job descriptions, recruitment, training), of motivation (performance appraisal, profit sharing, stock ownership), of information (strategic, economic and operational information), and of empowerment (consultation), all of which are considered high-involvement HR practices (Arthur 1994; Benson Young / Lawler 2006; Guthrie 2001).

Table 1:　HR system configurations resulting from cluster analysis of SMEs (n = 176)

HRM profile HRM practices	strategic-high-involvement HR system (n = 30) mean	functional high-involvement HR system (n = 75) mean	traditional low-involvement HR system (n = 71) mean	ANOVA F	ANOVA F with Size as covariate
job descriptions	3.5_1	3.7_1	1.9_2	27.1***	25.9***
recruitment	2.8_1	2.1_2	0.5_3	28.1***	24.9***
performance appraisal	3.0_1	3.2_1	0.7_2	57.2***	55.3***
training	$.005$	$.007_1$	$.004_2$	4.1*	4.5**
strategic information	13.8_1	12.0_2	9.1_3	58.0***	55.6***
economic information	9.1_1	9.0_1	6.6_2	17.9***	17.3***
operational information	20.6_1	20.4_1	16.1_2	24.1***	22.3***
consultation	2.9_1	2.9_1	2.5_2	4.0*	4.5*
profit sharing	4.2_1	0.3_2	0.5_2	209.1***	189.4***
stock ownership	1.5_1	0.1_2	0.1_2	28.3***	23.0***

*: $p < 0.05$　**: $p < 0.01$　***: $p < 0.001$

Nota. Within rows, different subscripts indicate significant (at 0.05) pairwise differences between means on Tamhane's T2 test.

The second group of SMEs exhibit a *functional-high-involvement* HR system that is somewhat in-between the other two profiles. On one hand, these firms are more developed on most aspects of HR practices than the traditional firms. While they are of comparable size to the first group, the functional HR firms behave in a distinct manner, investing more in all practices, save in the ones aimed at motivating their employees (profit sharing, stock ownership). These firms are also the ones, among the three groups, that invest (in proportion to their turnover) the most in training activities. Thus, manufacturing SMEs of similar size can, at a certain moment, take different HR orientations, some (the traditional group) opting for a low-involvement HR system, others (the functional group) opting to invest significantly in the development of a

high-involvement HR system. Note that certain contextual elements that could help understand the motives for such orientations will be examined further on.

The third group is composed of SMEs whose HR system can be seen as *strategic-high-involvement*. This group clearly leads the other two in terms of the coverage or intensity of four practices, namely recruitment, strategic information, profit sharing and stock ownership practices. While being much less prevalent than the other two profiles, the *strategic-high-involvement* HR system shared by 17 % of the sampled firms is the one with the strongest high-involvement orientation. It is important to note here that the "strategic" appellation is borne out by the fact that the four dimensions (abilities, information, motivation, empowerment) of high-involvement work systems are the most developed. These firms first aim to better select candidates for employment (recruitment), if selected to better inform them of the mission, objectives and results of the firm (diffusion of strategic information), and then to have them participate in the financial performance of the firm (profit sharing and stock ownership), all practices recognized to be positively related to employee productivity and corporate financial performance (Benson/Young/Lawler 2006; Guthrie 2001).

Contextualising HR systems in manufacturing SMEs

With regard to the second research question, one-way ANOVA was used to evaluate the equality of the means of the contextual variables across the three HR systems and thus assess if different system configurations can be associated with comparable external and internal factors (see Appendix 3 for the correlation matrix of the contextual variables**)**. Results presented in Table 2 indicate significant differences for seven out of fourteen contextual variables, especially between traditional-low-involvement SMEs and strategic-high-involvement SMEs. Again, these differences persist when the firms' size is controlled for. Contextual differences between profiles exist with regard to their product/market structure (development of networks), the sector in which the sampled SMEs operate (technological intensity), their manufacturing technology (presence of quality standards, assimilation of planning and logistics applications), and their internal dynamics (chief executive's level of education, presence of a board of directors, presence of a HR manager).

Returning to Table 2, one finds that the SMEs showing the traditional-low-involvement profile distinguish themselves from those in the other two groups by weaker networks, by a less frequent presence of a board of directors and of a designated HR manager. These firms are also less apt to conform to quality standards (e.g., ISO) and to assimilate manufacturing technology in the form of planning/logistics applications (e.g., MRP-II). In other words, firms in which the HR is less developed are characterized notably by less intense and diversified networking with business partners, a simpler management structure and a less sophisticated use of manufacturing technology. The absence of a board of directors and of a HR manager could be associated to a more preponderant role of the owner-manager in the decision-making and operations management of these firms.

Moreover, SMEs within the strategic HR group are bigger and are led by a chief executive with a higher level of education, on average, than firms in the other two

groups. These SMEs are also more diversified in terms of their client base (less commercial dependency) than SMEs within the traditional group.

Table 2:　Breakdown of contextual variables by HR system configuration

HRM profile Contextual variable	strategic high-involv. HR system (n = 30) mean	functional high-involv. HR system (n = 75) mean	traditional low-involv. HR system (n = 71) mean	ANOVA F	ANOVA F with Size as covariate
Size					
Number of employees	96_1	62_2	56_2	8.3***	-
Product/market structure					
Commercial dependency[a]	33_1	44	47_2	4.1*	2.1
Development of networks number of partnerships[b]	4.4	4.8_1	2.2_2	8.1***	7.5***
Development of products R / D budget / sales	0.020	0.029	0.022	0.6	0.5
Development of markets sales exported / sales	0.24	0.25	0.16	2.4	2.0
Sector Technological intensity[c]	0.27	0.23	0.11	2.3	3.0*
Manufacturing technology					
Presence of quality standards[d]	0.69_1	0.56_1	0.34_2	6.7**	5.1**
Advanced manuf. systems assimilation[e] product design technology	6.8	6.9	6.4	0.1	0.5
manufacturing process technology	5.0	5.1	4.3	0.4	1.3
planning and logistics applications	12.8_1	9.9_1	7.3_2	7.2***	4.1*
Internal dynamics					
Chief executive's education level[f]	3.6_1	3.1_2	3.0_2	4.6*	3.5*
Chief executive's experience level[g]	17	17	20	1.5	1.3
Presence of a board of directors	0.87_1	0.89_1	0.58_2	12.5***	11.3***
Presence of a labour union	0.33	0.35	0.25	0.8	0.8
Presence of a HR manager	0.60	0.59_1	0.37_2	4.4*	3.6*

*: $p < 0.05$　　**: $p < 0.01$　　***: $p < 0.001$

Nota. Within rows, different subscripts indicate significant (at 0.05) pairwise differences between means on Tamhane's T2 test.

[a]　percent of sales to 3 largest customers

[b]　procurement, design and R/D, production, distribution, and marketing partnerships with prime contractors, customers, suppliers, competitors, research centers, colleges and universities, and other SMEs

[c]　associated to the manufacturing sector of activity (0: low or low to medium-tech, 1: medium to high-tech)

[d]　e.g., ISO

[e]　$\Sigma_{k=1,6}$[perceived mastery of advanced manufacturing technology adopted, on a scale of 1 to 5]
　　product design technologies = computer-aided drawing, CAD, CAM, CAD/CAM
　　process technologies = PLC, CNC, robots, FMS, automated handling
　　planning and logistics = computer-based production scheduling, bar-coding, EDI, MRP, MRP-II, ERP

[f]　grade school: 1, high school: 2, college: 3, university: 4

[g]　number of years' experience in the sector or industry

With regard to SMEs in the functional HR group, certain contextual aspects that characterize them are comparable with the traditional group, whereas other aspects are comparable with the strategic group. On one hand, organisational similarities with the traditional group exist with regard to size and chief executive education level. On the other hand, similarities with the strategic group are seen mainly in terms of manufac-

turing technology (presence of quality standards, mastery of planning and logistics applications) and internal dynamics (presence of a board of directors and of a HR manager). Here, the "in-between" nature of the functional group is reaffirmed.

As shown by the preceding results, size by itself is insufficient to explain the three distinct HRM system configurations observed across the sampled SMEs. Even if they are of comparable size, firms belonging to the traditional and functional groups present HR profiles that are quite different from one another, the latter having developed most aspects of their HR system in greater fashion. Thus, contextual factors must be taken into account if one is to further understand the divergent choices of these two groups with regard to HR practices. This means including certain elements of the SMEs' product/market structure (development of networks), manufacturing technology (presence of quality standards, mastery of advanced manufacturing technology for planning and logistics), and internal dynamics (presence of a board of directors and of a HR manager). The presence of a designated HR manager and of a board of directors could be considered factors that both reinforce the firm's orientation toward high-involvement HR systems and facilitate the implementation of this orientation.

On their part, SMEs in the strategic HR group differ from the functional group by their greater size, the higher level of education of their chief executive, and less dependency upon important customers. These contextual elements can partly explain the significant gap between the two groups with regard to the coverage of recruitment and incentive compensation practices, and to the intensity with which strategic information is communicated to employees. Alluded to previously, the practices that characterise high-involvement work systems form a "gestalt" to the extent that, in enhancing the abilities, the motivation, the information and the empowerment of employees, they "collectively define a meaningful and coherent slice of organisational reality" (Miller 1981: 8).

Many manufacturing SMEs complain of recruitment problems, especially when they must employ specialised labour or operate in a technologically-intense industry. Reaching a certain size may increase their difficulties and incite them to develop their practices in this regard, that is, to adopt a strategic-high-involvement HR profile. Interacting with a more diversified client base requires greater flexibility on the part of these firms, flexibility that cannot be obtained without the commitment and motivation of all members of the organisation. Communicating strategic information (e.g., the firm's mission, objectives, financial results) and implementing incentive compensation plans can increase such commitment and motivation on the part of all employees. These same practices can also increase retention and facilitate recruitment of qualified personnel. Finally, better-educated owner-managers are apt to be more confident and competent, and thus be more prone to implement information and compensation practices that require greater transparency, sharing and delegation.

Implications and limitations

The results of this research confirm the relevance of using the open systems approach and certain of its derived theories such as contingency theory to investigate the HR system configurations of SMEs. While many of the contextual factors analysed have been previously identified as determinants of HR practices, to our knowledge, this

study is the first to relate configurations of HR systems on one hand, with contextual factors of such breadth on the other hand. Previous studies have most often included a limited number of contextual factors and HR practices, and sometimes just one factor or practice. The more holistic approach taken by the present study, inspired from open systems theory, allows for a better understanding of the manner in which the HR systems observed in manufacturing SMEs are contingent upon different external influences and internal dynamics. In particular, this study is to our knowledge the first to highlight the role of a board of directors with regard to the development of HR systems, thus constituting a concrete example of the relevance of institutional theory to HRM research. Here, submitting the firm to the scrutiny and counsel of external partners from various fields may create pressures to implement the more widely-recognized or "best" practices.

This research also has implications for managers and practitioners in that it tends to indicate that there is no "one size fits all" solution to the HR problem in manufacturing SMEs. Instead, "made-to-measure" HR systems seem to better fit the reality of most SMEs whose survival, strategic development and competitiveness is based on their proximity to their markets and their capacity, as complex adaptive systems, to quickly adapt and respond to external and internal pressures through self-organisation. For instance, when shifts in the business environment cause new problems that require strategic, structural or technological choices, or provide new business opportunities, the firm's HR profile must be assessed in terms of strengths and weaknesses. HR system changes should then be made systemically, that is, should be strategically aligned with these choices or opportunities.

This investigation also has limitations that must be mentioned. While the firms surveyed are fairly representative of the general population of Canadian manufacturing SMEs in terms of size and industry, there might yet exist a sample bias in that these are firms that have chosen to undertake a benchmarking exercise. As such, these firms could differ from the general population, notably in terms of strategy and level of development (Cassell/Nadin/Gray 2001). While accounting for certain contextual characteristics such as size and sector that account for the great heterogeneity of SMEs, this study has not accounted for others, such as the characteristics of the workforce, that might affect the HR behaviour of SMEs. Also, a limited number of HR practices were taken into consideration, and while their coverage and intensity were measured, the exact nature of practices such as training and the way in which they are implemented could have been determined with more precision.

Conclusion

In an economic context that has become fundamentally globalised, manufacturing SMEs must leverage their HR system in order to transform themselves into "intelligent" and "agile" organisations, or into "world-class enterprises", continuously adapting and changing in a process of strategic alignment or fit. Of increasing importance is research that provides more rigorous measurement, more accurate description, and better explanation of this process. As a further step in that direction, this study has framed configurations of HR practices within an open systems framework to provide a richer view of HRM in the context of SMEs. As such, the open systems approach

constitutes a fruitful complement to the contingency approach and the "resource-based view" that are often used to justify HRM choices in the context of large enterprises.

Further research along this new line is needed however, in order to gain knowledge on the processes by which firms manage their human resources to support their core capabilities and their strategic moves. Process-based research, more qualitative in nature, will also be needed to further understand the causal dynamics between human resources, knowledge and strategic management processes, and performance. Such research should provide richer theoretical insights into the complex interplay between HRM, organisational knowledge and strategy. Investments in human resources alone cannot insure greater performance unless they are coherent with the competitive environment, the strategic objectives, the structural and technological context of manufacturing SMEs. To this end, these enterprises must increase their HRM capability, and thus seek increased support from researchers and practitioners.

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Appendix 1:   Empirical studies of the contextual determinants of HR practices

	Empirical studies	Country	N	SME (0-100)	SME (0-250)	SME (0-500)	SME / LE
1	Aragón-Sánchez /Sánchez-Marín (2005)	Spain	1 361		√		
2	Bacon/ Ackers/ Storey/ Coates (1996)	United Kingdom	229		√		
3	Barber/ Wesson/ Roberson/ Taylor (1999)	United States	303				√
4	Baron/ Hannan / Burton (1999)	United States	76				√
5	Bayo-Moriones / Merino-Diaz de Cerio (2004)	Espagne	965				√
6	Beaumont / Hunter / Sinclair (1996)	United Kingdom	156				√
7	Budhwar / Khatri (2001)	United Kingdom and India	93				√
8	Cassell,/ Nadin/ Gray / Clegg (2002)	United Kingdom	122		√		
9	Chowhan (2005)	Canada	5 501				√
10	De Kok / Uhlaner (2001)	The Netherlands	16	√			
11	Deshpande / Golhar (1994)	United States	100				√
12	Golhar / Deshpande (1997)	Canada	143				√
13	Gudmundson / Hartenian (2000)	United States	207			√	
14	Guilhon/ Martin / Weill (1998)	France	42			√	
15	Hanks / Chandler (1994)	United States	133			√	
16	Hausdorf / Duncan (2004)	Canada	175				√
17	Heneman / Berkley (1999)	United States	117	√			
18	Kinnie / al. (1999)	United Kingdom	3			√	
19	Knoke / Kalleberg (1994)	United States	688				√
20	Kotey / Slade (2005)	Australia	371	√			
21	Kuratko / Hornsby (2001)	United States	184			√	
22	Leung (2003)	United States	4			√	
23	Machin / Wood (2005)	United Kingdom	7 000				√
24	Matlay (1999)	United Kingdom	6 000		√		
25	Mazzarol (2003)	Australia	4	√			
26	Messeghem (2003)	France	72	√			
27	Ng / Maki (1993)	Canada	356				√
28	Nguyen / Bryant (2004)	Vietnam	89		√		
29	Otham (Bin) / Poon (2000)	Malaysia	108				√
30	Peck (1994)	United States	63				√
31	Poutsma/ Hendrickx/ Huijgen (2003)	Europe (10)	4 600				√
32	Raghuram / Arvey (1994)	United States	176				√
33	Reid/ Morrow/ Kelly/ Adams/ McCartan (2000)	Northern Ireland	219	√			
34	Rutherford/ Buller / McMullen (2003)	United States	2 903			√	
35	Sanz-Valle/ Sabater-Sánchez/ Aragón-Sánchez (1999)	Spain	200		√		
36	Shah / Ward (2003)	United States	1 748				√
37	Schuler / Harris (1991)	United States	1			√	
38	Schuler / Jackson (1987)	United States	304				√
39	SHRM (2002)	United States	571				√
40	Swart / Kinnie (2003)	United Kingdom	3				√
41	Turcotte/ Léonard / Montmarquette (2003)	Canada	6 322				√
42	Verheul/ Risseeuw / Bartelse (2002)	The Netherlands	28	√			
43	Wagar (1998)	Canada	991			√	
44	Way / Thacker (2004)	Canada	202			√	
45	Weinstein / Obloj (2002)	Poland	303				√

Appendix 2: **Categorization of HRM studies by the contextual variables ana-lyzed and the nature of their impacts on the development of HR practices**

Contextual variables	Impacts on the development of HRM practices		
	Positive impacts	Negative impacts	No impact
Size (including growth)	2[a] - 3 - 4 - 7 - 9 - 10 - 11 - 12 - 16 - 17 - 19 - 21 - 22 - 23 - 28 - 29 - 32 - 35 - 37 - 40 - 42 - 44 - 46	5 - 40	
Strategy (innovation, quality, etc.)	1 - 5 - 10 - 14 - 23 - 24 - 27 - 30 - 31 - 33 - 36 - 38 - 39 - 42 - 46	46	8
Presence of a labour union	7 - 9 - 32 - 42 - 44	10 - 28 - 37	5 - 19 - 23 - 46
Sector (industry)	1 - 7 - 17 - 42	32 - 46	9
Owner-manager (entrepreneur)	2 - 4 - 11 - 26 - 43	43	
Competitors	5 - 9 - 19 - 32 - 46		42
Customers	2 - 6 - 10 - 18 - 41		
Stage of development	7 - 15 - 35 - 40		
Technology	5 - 9 - 32 - 40		
Age of the firm	7	37	5 - 35
Characteristics of the labour force	9 - 32 - 42		19
Presence of a HR manager	17 - 45		
Family enterprise		34	

[a] The number used to identify a study is the one attributed in Appendix 1.

Appendix 3: Correlation matrix of the contextual variables

Correlation	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Size	-														
2. Sector (technological intensity)	-.08	-													
3. Commercial dependency	-.19	.00	-												
4. Development of networks	.11	.19	.04	-											
5. Development of products	-.11	.30	.18	.10	-										
6. Development of markets	.29	.06	-.04	.10	.20	-									
7. Presence of a board of directors	.18	.10	-.08	.15	.02	.20	-								
8. Presence of a labour union	.26	-.04	-.06	.11	-.09	.06	.14	-							
9. Presence of a HR manager	.17	-.04	-.07	.15	-.11	.06	.35	.20	-						
10. Chief executive's education level	.12	.12	.02	.08	.23	.13	-.03	.03	-.13	-					
11. Type of production	.15	.06	-.01	-.03	.16	-.07	.02	-.08	.08	.07	-				
12. Presence of quality standards	.14	.32	.08	.17	.07	-.01	.30	.21	.20	.09	.01	-			
13. Product design technology	.26	.14	.13	.15	.10	.21	.07	.09	.12	.16	-.02	.15	-		
14. Manuf. process technology	.41	-.23	.08	.17	.00	.11	-.00	.13	.09	.03	.10	-.03	.38	-	
15. Planning and logistics apps	.31	.04	.01	.23	-.00	.20	.11	.12	.20	.11	.16	.19	.32	.30	-

Nota. Correlations greater than 0.15 are significant ($p < 0.05$, two-tailed, $n = 176$).