Editorial: human resource management in high-tech companies

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Biographical notes: Professor Dominique R. Jolly is a Faculty Member of CERAM Sophia Antipolis (France). He teaches 'Strategic Management' and 'Technological Management' in undergraduate, postgraduate and post-experience programmes. He has taught as Visiting Professor in several countries including: the United Kingdom, Switzerland, Denmark, China, Mexico, Indonesia, Turkey, Yugoslavia, Moldova and Senegal. He spent 1993–1994 as a Visiting Professor at the École des H.É.C. in Montréal (Québec). His research focuses on technological management. His articles were published in different academic journals: *The International Journal of Technology Management*, *Technovation*, *Innovation: Management, Policy & Practice*, *The European Management Journal*, *The Asia Pacific Business Review*, *Management Decision*, *The Harvard Deusto Business Review*, and *European Business Forum*. He also acts as reviewer for many of these journals. He is a Member of the Executive Council of the International Association for the Management of Technology (IAMOT).

This special issue bundles seven papers presented at the second international conference on *Technology & Human Resource Management* held at CERAM Sophia Antipolis, France in May 2003. Three topics are covered: the distinctiveness of human resource management in high-tech companies, the dynamics of human capital building in these contexts and the implementation of human resource management practices suited to the company's stage of development and line of business.

Introduction

There are many variables that influence human resource management (HRM) policies and practices. Some are identified in Figure 1. These variables can be divided into two groups: contextual determinants and organisational factors. The company has very limited control over the first group because of its nature. The factors in the second group result mostly from a company's history and its prior decisions. Technology has influence in each group (as shown at the bottom of the figure): this may result from the technological content of the business itself or from the use of technological tools. This

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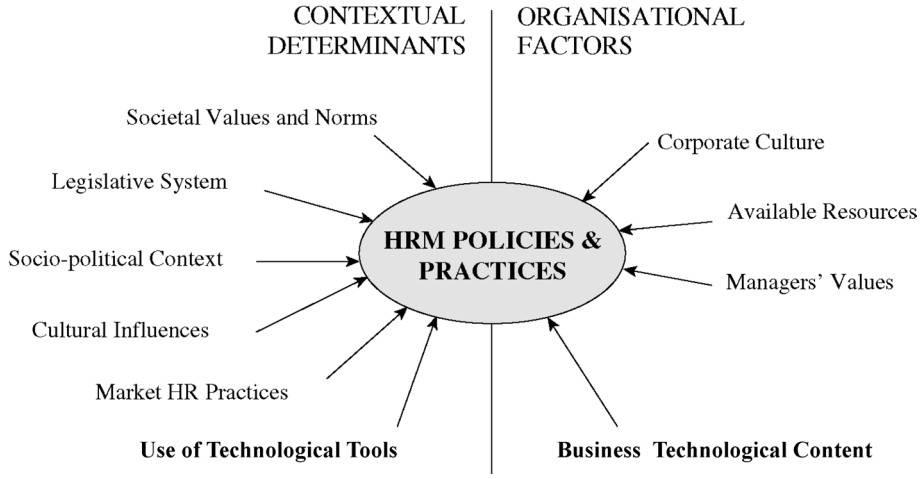
distinction is referred to as either technology as an end (the producer view), or as a tool (the user view) [1,2]. Our focus will be on the effect of business technological content.

Figure 1 Factors influencing HRM policy and practice



High-tech companies usually face environments that are fast-paced, turbulent, unstable and uncertain. Managing innovation and generating change in these contexts require flexible organisations [3]. In these environments, companies face strong competitive pressures: knowledge flows from one place to another, demands change quickly, and labour markets might be very tense [4]. High-tech companies are usually defined as firms dedicating a significant amount of their expenses to R&D; i.e., R&D/sales more than 4% [5]. These companies operate in sectors such as: electronics, semiconductor, telecommunications, software, automation, specialty chemicals, pharmaceuticals, bio-tech, nuclear industry, new materials, aeronautic and aerospace, etc.

In high-tech companies, a majority of the human capital is highly skilled and educated. A large proportion of the staff in these industries is made up of scientists, engineers and technicians [6]. An important feature of high-tech industries is their large proportion of knowledge workers. This gives rise to the following question: Does technological intensity impact HRM's policies and practice? Should HRM in high-tech companies be treated as a specific case that requires different theories and analytical tools? This is the common thread of the papers presented in this special issue of the *International Journal of Technology Management* dedicated to this special issue on '*Human Resource Management in High-tech Companies*'.

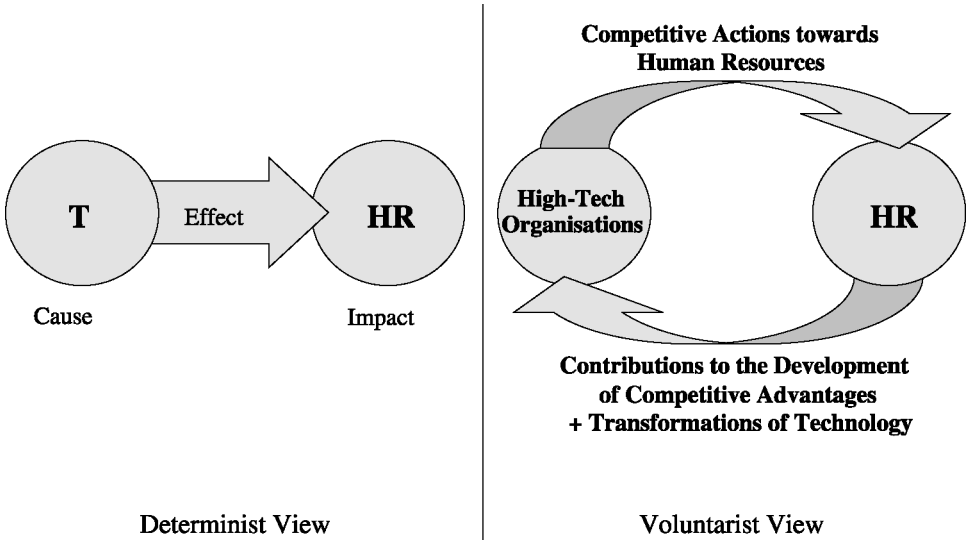
The perspective adopted here is much more a voluntarist (i.e., adaptive) view rather than a simple determinist view as described by Figure 2. According to this voluntarist (adaptive) view, the impact of technology on HRM is only one side of the relationship between technology and people. The interactions between human resources and high-tech companies are analysed as a two-way process. This includes:

- The effect of human resources on high-tech companies. Papers in this special issue have focused on how these human resources can contribute to the development of competitive advantages in high-tech businesses. The distinctive characteristics of human resources might create some scarcities or even shortages in the labour market.

Interactions between human resources and high-tech companies also include:

- The competitive actions of high-tech companies towards human resources in order to access and attract qualified human resources; to retain talented people; and to develop the human potential.

Figure 2 HRM in high-tech companies



This special issue is divided into three tracks:

1 *The distinctiveness of HRM in high-tech companies*; i.e., the specific features of recruitment and selection (Ramirez), compensation (Chênevert and Tremblay) and career orientation (Hourquet and Roger). The impact of country determinant is also discussed in the first two papers.

2 *The dynamics of human capital building* in relation to labour market scarcity, business growth imperatives and the company's absorptive capacity (Cloutier and Delorme, Hayton and Zahra).

3 *The implementation of HRM* practices suited to the company's stage of development (Autier and Picq) and line of business (Viardot).

This special issue offers various and complementary methodological approaches. It gathers excellent questionnaire-based research as well as more exploratory and qualitative essays relying on in-depth interviews and qualitative case-based research. Papers offer different perspectives from North America (Cloutier and Delorme, Hayton and Zahra) and Europe (Autier and Picq, Hourquet and Roger, Ramirez, Viardot) as well as comparisons between the two settings (Chênevert and Tremblay).

Fabienne Autier and Thierry Picq rely on the 'resource-based view' for analysing how human resources contribute to the building of competitive advantages. Research was carried out in 20 software companies of the French video games industry. It was hypothesised that competing through people is especially relevant in knowledge-based industries. This is because people in these contexts are the most distinctive resource.

Firms' strategies and HRM practices were analysed using semi-directive interviews (complemented by analysis of websites and annual reports). Authors were able to infer four development stages from their investigation:

- the studio – characterised by a desire for non-formalised practices
- the small 'conscious' firm with emerging methods and systems
- the 'becoming editor' which sets up a structured HRM policy, and
- the multinational editor with integrated and structured HRM practices.

When analysing the transformations incurred by human resource strategies as companies move from infancy to maturity, two results were found. First, human resource strategies evolve significantly to suit company development stages. Second, as companies grow, they tend to get rid of rare, specific and non-substitutable human resources in favour of more commonplace and generic human resources. Value creation moves progressively from individual creativity to collective productivity.

Denis Chênevert and Michel Tremblay analyse the effect of the technological environment on the design and performance of compensation strategies. Simultaneously, they examine whether there exists differences across countries. The authors argue that country is a better determinant of compensation policy than technological intensity. They hypothesise as well that compensation strategies of technology intensive firms exhibit some idiosyncratic features. Data collection relies on a questionnaire survey administered in three countries (Canada, France, and Great Britain). Answers from 602 HRM or compensation managers, mostly at the divisional level, were collected (respectively: 252, 233, and 117). The hypothesis was tested using regression analysis. Results clearly demonstrate that countries explain differences in compensation policies better than the level of technology. They also show that some compensation policies are better suited to high-tech sectors. Results suggest that approaches such as market oriented strategies, variable compensation policies, risk sharing programmes, individual performance rewards, and decentralisation, are more efficient in high-tech companies than in low-tech companies.

Martin Cloutier and Michel Delorme base their paper on a survey conducted in Québec with 124 bio-technology firms and some secondary data. The results are mostly descriptive: difficulty of access to and retention of qualified human resources have been found as one of the most important obstacles to growth. Bio-industries are characterised by a fierce competition to access highly qualified human resources (scientists, technologists, as well as managers). Because human resources contribute to competence building and competitive advantage, the authors suggest that this shortage acts as a limit to growth. A model of the human capital building dynamic, using an influence diagram, shows the trade-offs that companies face.

James Hayton and Shaker A. Zahra have investigated the effect of the characteristics of human capital in high-tech new ventures' top management teams on their firms' absorptive capacity. In new ventures, knowledge brought by top management teams frequently constitutes a significant part of the firm's total knowledge. Gaining access to new knowledge and technological capabilities through external sources is constrained by the company's absorptive capacity. The survey of the two authors of 340 high-tech ventures in the US has shown that top management teams' human capital diversity (i.e., heterogeneous personal histories) positively moderates the relationship between

venturing activities (alliances and acquisitions) and the company's innovative performance. The greater the human capital diversity of the top management team, the higher the effect of external sources on the firm's performance. However, the managers' higher formal education, greater experience of the industry and executive positions did not prove to positively moderate the effect of external sourcing on performance.

Pierre-Guy Hourquet and Alain Roger study promotion and career paths of the R&D professionals. In-depth interviews conducted with twenty professionals in various types of private organisations generated one interesting hypothesis, seldom mentioned in the literature. Authors suggest that the career orientation of R&D professionals is driven more by specific events – often due to chance and unexpected events – than by following specific tracks or predetermined steps. This research also confirms the role played by the researcher's personal social network in his career moves.

Jacobo Ramirez raises the question as to whether there exist some differences in HRM policies and practices between low-tech versus high-tech firms. In this paper he reports findings on recruitment and selection. He looks simultaneously at the impact of cultural and national factors by conducting the same study in France and in Britain. The author hypothesised a global scope in recruitment for high-tech companies, as well as an emphasis on intangible skills, a preference for younger employees, and the use of Net-recruitment and assessment centres. Hypotheses were tested using data collected with the same questionnaire in manufacturing companies in France (70) and Britain (93). Analysis of variance was conducted with technological intensity and country of origin as independent variables and recruitment and selection as dependent variables. Results support the hypothesis of a global scope of recruitment (at least in France) and of Net-recruitment in high-tech companies (both in France and Britain). But, the results do not support an emphasis on intangible skills in high-tech companies, neither for young staff nor for the use of assessment centres. Nevertheless, significant differences between the two countries were observed for age, as France supports hiring younger employees more than Britain.

Eric Viardot has studied HRM practices in the ten largest information-based service companies in Europe. These high-tech services include: consulting, systems engineering and integration, support services, information systems outsourcing and network services. The author contends that human resources are decisive in information technology-based services because of their impact on customers, on quality as well as on profitability. Seven lessons for HRM in information-based service companies were inferred by the author from his interviews with executives. These include considering 'people care' as a core value. Recruitment, education of people, professional development, empowerment, etc. were also identified as areas where emphasis is due.

As Figure 1 shows, the study of the idiosyncratic features of HRM in high-tech environments considers technology as an influential variable. High technological content in the business creates a specific context that must be taken into account. This is only one facet of the technology/human resource relationship. Technology can also be considered as a tool implemented in a given business process (whatever the technological intensity of the business). In this case, the analysis of the interactions between technology and people covers human issues in implementing information and communication technologies [7]. All streams of research related to 'people and technology' will be the target of the call for papers for the third international research conference on 'Technology and People' to be held in 2005 at CERAM Sophia Antipolis (France).

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Appendix: Scientific Committee of the Second International Conference on Technology ando Human Resources

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