

Building innovation capacity: the role of human capital formation in enterprises – a review of the literature

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Australian Government
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Building innovation capacity: the role of human capital formation in enterprises

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This paper explores the wide range of literature that links innovation with human capital development. From this review, the authors develop a model of the principal factors contributing to human capital. The model will form the basis of an empirical investigation into developing innovation capacity in medium-to-large Australian enterprises in the next phase of the research project.

Key messages

- ✧ Innovation performance at the enterprise level depends on the ability to acquire, develop and exploit new knowledge. Human capital and technology are the principal factors driving innovation capacity.
- ✧ Human capital development is stimulated by appropriate human resource management practices and two ancillary services: the learning and development system, which must go beyond training and create learning cultures in enterprises; and the tertiary education system, which is playing an increasingly important role in the new learning and development systems of enterprises.
- ✧ The bundling of human resource practices is important in all three of the key factors involved in developing human capital for enterprise innovation: people management, knowledge management and creativity management.
- ✧ Developing innovative capacity in the context of human capital formation is a complex process and requires a balanced human resource management approach utilising cooperative employee team involvement and individual self-expression to achieve 'creative ecologies'.

Tom Karmel
Managing Director, NCVER

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Macro framework of innovation

Introduction

The ability of enterprises to innovate depends on various factors, including both the technological and human resource management aspects of innovation. This literature review forms part of a wider research project, the aim of which is to identify the role of human capital formation (and its component parts) in promoting innovation in Australian enterprises.¹ The purpose of the literature review is to develop a theoretical framework, based on the extant literature, to guide the empirical work, which is the next phase of the project.

While recognising the critical role of technology in innovation, this review is concerned with human resource management (including the learning and development system and its links to the tertiary education system). The central model used in the overall project takes the view that there is a range of stimulus factors (human and technological) affecting the capacity of enterprises to innovate. The model then posits that effective use of innovation capacity will lead to increased 'innovation performance'.

While there has been much research that has examined various specific aspects of this model from a human resource management aspect, there has been no study which has attempted to bring the component parts together in an overall approach, in terms of building an innovation capacity that will lead to innovation performance, which is the aim of this research project. In particular, there has been a paucity of research in the area in the Australian context.

This review firstly presents a macro framework of innovation in enterprises which identifies the technological and human innovation stimuli that are needed to build innovation capacity leading to innovation performance. The next chapter then examines in more detail the role of human resource management, the learning and development systems of enterprises, and the tertiary education system as stimuli for innovation capacity. The following chapter examines studies on how the human resource infrastructure discussed in the previous chapter is used to stimulate innovation capacity, with particular consideration of the role of people management, knowledge management and creativity management.

Before we can discuss the elements of this system in detail, we need to clearly explicate what we mean by innovation and its role in the business enterprise.

Role of innovation in business enterprises

'Innovation can be defined as the creative application of knowledge to increase the set of techniques and products commercially available in the economy' (Courvisanos 2007, p.46). Kalecki (1954, p.158) identifies such knowledge application as making '... necessary new investment in productive and transportation facilities, etc.', and as such, stimulates economic activity. Harnessing this process for business enterprise and economic development requires an appreciation of the factors that produce knowledge and creativity. However, innovation as a process is complex and

¹ The review applies mainly to medium and large enterprises as small enterprises are unlikely to have the breadth and sophistication of practices under discussion available to them.

poorly understood, because it is deeply rooted in the uncertainty of the future world, from which arise new products, processes, movements, organisations and sources of raw material. All that is known is that innovation brings change, and something ‘new’ emerges, which cannot be precisely modelled; consequently, a framework of analysis that guides the researcher through the complexity of innovation is the best approach.

Innovation has long been regarded as essential for enterprises and national economies to thrive in globalised and increasingly competitive markets (Christensen & Raynor 2003; Department of Trade and Industry [UK] 2003). However, the historically poor innovation performance of Australia in relation to other developed economies has concentrated the efforts of Australian researchers and policy-makers in addressing this issue. In this context, in 2008 the federal Rudd Labor Government made innovation an early policy priority, with the creation of the Department of Innovation, Science and Research and the commissioning of the Cutler review of Australia’s innovation performance (Cutler 2008). Even before the full extent of the Global Financial Crisis was realised, the Cutler review made the strong argument that Australia’s innovation performance was poor by international standards and that there was a key role for government policy in promoting innovation in enterprises.

Since this review, the global economic downturn has served to emphasise the need for Australian industry to become more innovative in order for the country to meet the twin global challenges of shifting from debt-driven consumerism and from high-carbon emissions production into sustainable development (Stiglitz 2010). Australia is still economically too trade-dependent on a few large industries which are vulnerable to the vagaries of the international economy (especially commodities, tourism and education) and to the international pressures for ecological sustainability. The need to diversify in order to ameliorate any future economic volatility and environmental destruction places enormous pressure on Australia’s innovation processes. This includes the three major types of innovation—product (new goods and services), process (new ways of doing things) and organisational (new and more productive ways of organising work in order to support product and process innovation).

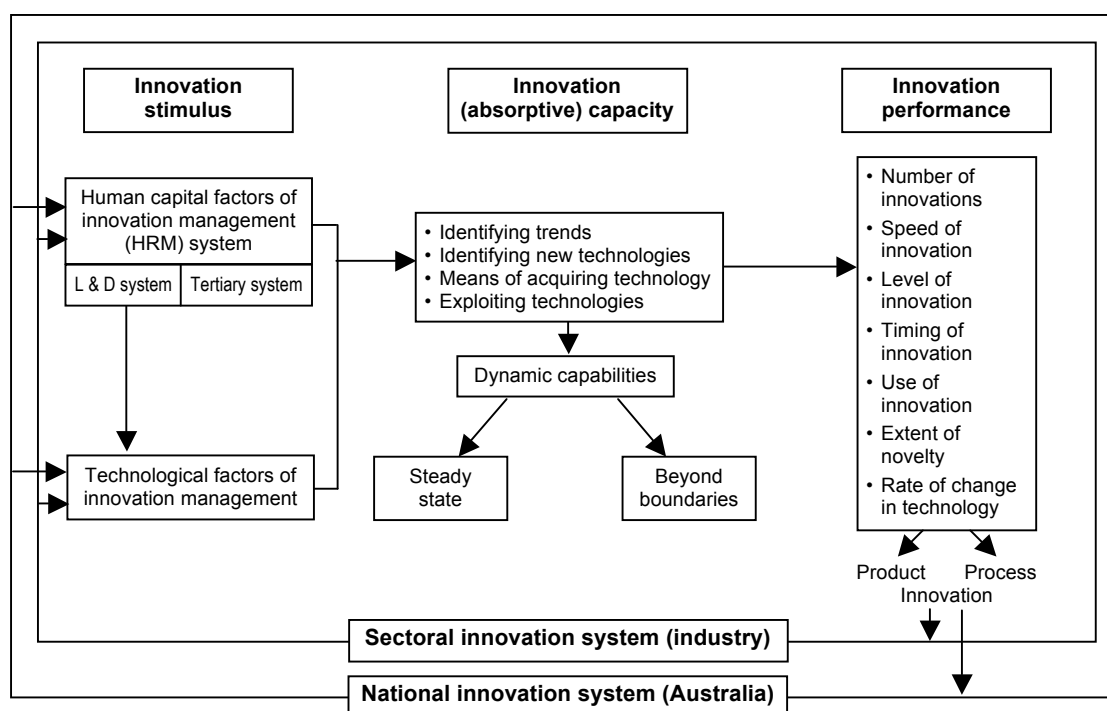
Building innovation capacity: a macro framework

Innovation capacity is the ability of enterprises to identify trends and new technologies, as well as to acquire and exploit this knowledge and information (Tidd, Bessant & Pavitt 2005). This innovation ‘capacity’ concept needs to be clearly distinguished from dynamic innovation ‘capability’; the latter deals with the firm’s specific ability to continuously transform knowledge and ideas into profitable innovations. With regard to innovation ‘capability’, Terziovski (2007) develops a leadership-based model in which firms innovate across three domains—new product development, sustainable development and e-commerce, using all aspects of the firm’s capacities, including human resource management. This current investigation develops a framework to examine the prior capacity-building function and role for employees, through the human resource management function, to acquire the ability to innovate in order to be capable of working within a strategic innovation model of the type set up by Terziovski.

Figure 1 is an adaptation and more detailed extension of the macro framework in Prajogo and Ahmed (2006) known as the Stimulus-Capacity-Performance approach. In the framework, technological capital and human capital are the stimulus factors which develop innovation capacity. The process-based conception of innovation (or absorptive) capacity, links technological and human capital stimuli and highlights the role of learning in the innovation process (Lichtenthaler 2009). It is this innovation capacity that determines how effectively an enterprise can undertake the innovation commercialisation process through the five sub-processes, from imagining and incubating, to demonstrating, promoting and sustaining (Jolly 1997). The better built the innovation capacity, the more effectively an enterprise can conduct this innovation process and thus, the stronger the innovation performance.

For a long time innovation research concentrated on the technological factors that enhanced innovation capacity, identifying all the technical aspects of the innovation process such as research and development (R&D), physical sciences education, engineering and design (see Tidd, Bessant & Pavitt 2005, p.112). As studies on the human factors of innovation within the enterprise began to appear in the 1980s, there arose a need to link these human factors into an overall macro-perspective of the complete innovation process operating within an enterprise. Figure 1 presents such a macro framework, based on the research literature on innovation in business enterprises.

Figure 1 Macro framework of innovation



There are a number of factors that affect enterprises' ability to innovate. These include internal factors and external factors. The internal factors are seen inside the macro framework and include the technical skills required to develop successful in-house R&D outcomes, the ability to detect technological changes in the environment, and the development of core competencies from which innovation can develop. The external factors are the boundary conditions of the macro framework and are not dependent on the enterprise. Instead, they are dependent on the life-cycle position of the market which the enterprise serves, the impact of government policies designed to stimulate innovation, and the nature of the innovation systems that feed into the national and regional business activity. All these are represented by the two boundary lines in figure 1.

There is a significant body of research on the technological factors of innovation and how to manage these factors to better stimulate innovation in enterprises. This research has also been well synthesised (see Ahamed & Lawrence 2005). Only since the early 1980s, with the work of the Harvard Business School (notably, Kanter 1983)—rediscovering the path-breaking book by Penrose (1959)—have human capital factors been specifically identified in terms of management to induce innovation. The focus of this literature review is on the role of these human capital formation factors in the management of innovation.

A range of studies have suggested that human factors within the enterprise are critical to innovation (Kanter 1983; Gupta & Singhal 1993; Hauser 1998). Thus, the ability of enterprises to innovate depends on the effective management of human resources and, in particular, the learning and development (L&D) practices instituted by enterprises that increase both the quantity and quality of workforce innovation skills. It should be noted that the education system (from primary to

secondary and then on to tertiary education) underpins any enterprise learning and development system. Studies in Denmark (Laursen & Foss 2003) and Spain (Jiménez-Jiménez & Sanz-Valle 2008) show that better human resource management practices and the establishment of new learning and development systems increase enterprise innovation. However, these studies have not established a theoretical structure or exactly specified the broad human capital formation practices that enterprises need to put in place to improve their ‘innovation capacity’.

In figure 1, the human capital factors are underpinned by the internal learning and development system within an enterprise and the external tertiary (vocational education and training and higher education) education system which supports internal learning and development. The learning and development system can be defined as a systematic arrangement that enables the effective absorption of information, knowledge and ideas within a specified organisational structure. Such a system brings together internal and external training, individual career development and organisational development to develop in employees a learnt ability to recognise and use stimuli, thus building innovative capacity. An emerging small range of literature is examining the new forms of learning and development in Australia that are needed to support innovation-based learning enterprises. Another set of studies undertaken for the National Centre for Vocational Education Research (NCVER) have focused on the role of the external VET system in working with innovative enterprises to improve their abilities to implement product, process and organisational innovation—usually by supplying skills at the intermediate level (Dawe 2004; Curtain 2004; Garlick, Taylor & Plummer 2007). There have also been some studies in Australia on universities in their role of supporting innovative entrepreneurship and business development (Garlick 1998). However, these studies usually examine how the public tertiary system can support enterprises’ learning and development systems, rather than what the enterprises can do to develop their own learning and development systems. The principal focus of this study is to look inside enterprises and examine their specific learning and development systems, the tertiary education system that supports learning and development, and their interaction with the human resource management systems and practices of enterprises. The combination of these three systems represents the complete human capital formation factors relevant to enterprises and which are the basis for building innovation capacity. To date no Australian study has examined the interaction of these three systems for this purpose.

Both Prajogo and Ahmed (2006) and Jiménez-Jiménez and Sanz-Valle (2008) explain how empirical research does not show that innovation stimulus factors have any direct effect on innovation performance. Instead, both studies demonstrate that there is a link between the stimulus factors implemented at the enterprise level and development of ‘innovation capacity’ of the enterprise. Specifically, innovation capacity is the potential of the enterprise to innovate based on the capabilities of its employees to recognise, assimilate and apply innovation stimuli (Prajogo & Ahmed 2006, p.502). This innovation capacity perspective was first labelled ‘absorptive capacity’ by Cohen and Levinthal (1989) in recognition of the need for workers in the enterprise to absorb information and knowledge from external collaborations in R&D. Michie and Sheehan (1999) extend this absorptive capacity concept to the organisational setting in which employees operate and their ability to absorb innovation stimuli within the enterprise. Thus, it is the extent to which all the innovation stimuli (both technological and human) are able to be absorbed within the enterprise over time (that is, dynamic) that provides the capabilities for innovative performance. Tidd, Bessant and Pavitt (2005, p.73) identify two dynamic capabilities—steady state (or ‘doing what we do but better’) and beyond boundaries (or ‘doing differently’). Steady state works on a step-by-step (or continuous) process of incremental innovation, while beyond boundaries operates at a discontinuous level, which drives radical innovation. Building innovation capacity across both capabilities enables enterprises to focus on both incremental and radical innovation at the same time.

Many studies support the macro framework of managing both human and technological capital formation to build innovation capacity and agree that such capacity building leads directly to stronger innovation performance. Examples of such studies are Schroeder, Scudder and Elm (1989), Vrakking (1990), Brown and Karagozoglu (1993), Zien and Buckler (1997), Tang (1998),

Ahmed (1998). Major texts on building innovative organisations, for example, Dussauge, Hart and Ramanantsoa (1992) and Christiansen (2000), highlight the need to integrate the human factors into technology management in order to deliver effective innovation performance from enterprises—as measured by the various dynamic variables specified on the right-hand side of the framework in figure 1.

Prajogo and Ahmed (2006) identify four human capital innovation stimulus factors: leadership, people management, knowledge management and creativity management. Leadership sets the scene in determining the direction that the enterprise’s human resource management system will take, in that highly transformational leadership will create a more innovative business climate than highly transactional leadership. However, leadership is a separate area of investigation and will not be the focus of this review. From the human resource management systems perspective, the ‘leadership’ factor is not a human capital formation tool that can be implemented to build innovation capacity.

Human resource management, training and innovation

This chapter provides an overview of the human resource management literature and its links to innovation. The first section deals with modern concepts of human resource management and the move towards viewing human resource management as a strategic resource for enterprises. Following this, the much smaller corpus of research literature that engages with the role of human resource management as a stimulus to innovation capacity is reviewed. Two systems of learning are then reviewed with respect to innovation. One is the internal enterprise role of training and learning and development systems in relation to innovation capacity. The other is external to the firm and consists of the tertiary system and skills building, and their impact on innovation capacity.

Modern approaches to human resource management

Human resource management has become a touchstone of modern management practice. The roots of modern human resource management are to be found in the employee welfare notions that underpin the traditional bureaucratic ‘people processing’ approach to human resource management. This function concerns the minutiae of managing people in the workplace—payroll, records, terms and conditions of employment and, to a lesser extent, employee relations. The result has been that this orthodox personnel management function has not enjoyed any high strategic position in many modern enterprises, only reacting perfunctorily to strategy set elsewhere.

This situation began to change in the 1980s (Storey 1995). As the global economy became increasingly competitive (Best 1990), enterprises began to look to the skills and abilities of their employees as sources of future competitive advantage (Barney 1991). The example of Japan’s economic success in the 1980s was a powerful indicator to business leaders in the developed world that competitive success could be gained, at least partly, through better ways of managing employees. From this emerged the recognition that human resource management is essential in creating an organisational climate or culture in which employees’ skills and abilities can be effectively utilised for building innovation capacity. This basic recognition led to the development of two models of human resource management in the research literature.

One set of human resource management models emphasises the importance of training employees well at work in order to secure their commitment to the enterprise, and thus better business outcomes (Beer et al. 1984; Walton 1985; Rainbird 1994). These models are known as ‘soft’ models of human resource management as they emphasise universal and prescriptive ways of managing employees to yield the desired outcomes for enterprises. The other set of human resource management models links human resource management directly to business strategy and is known as the ‘hard’ approach to human resource management (Fombrun, Tichy & Devanna 1984; Legge 1995). This hard approach led to the development of work systems for high performance. Each is discussed separately below.

The soft approach human resource management model

Walton (1985) summarises the soft approach as moving ‘... from control to commitment’. Walton’s thesis is that, through better human resource management practices such as careful selection and recruitment, performance management, rewards and training, enterprises could move away from an emphasis on controlling their employees to a situation in which enterprises gave

employees more control and allowed them to make a greater commitment and contribution to the enterprise. This is the first place where a link to innovation can be drawn. Guest's (1987) normative model sets out the concept of better human resource management practices for better outcomes in the enterprise. Thus, human resource management practices become linked to better human resource outcomes, including commitment and flexibility. Such new practices yield organisational outcomes, including better job performance, lower turnover, and also higher levels of innovation.

The hard approach human resource management model

In the hard approach, the role of human resource management is to enable the core business strategy of the enterprise to be implemented effectively. This approach places less emphasis on the treatment of employees at work and securing employee commitment and more on treating employees as another—albeit critical—strategic resource for the enterprise, on which competitive advantage could be built. This brings human resource management into the strategy-formulation processes of the enterprise. It also means that, unlike the soft approach with its emphasis on universal prescriptions of 'better ways of managing', the hard approach is contingent on the circumstances of the enterprise. Schuler and Jackson (1987) show how different human resource management strategies might be lined up with different business strategies. Using Porter's characterisation of the three basic business strategies of innovation, quality enhancement and cost-reduction, Schuler and Jackson show that each strategy requires different human resource management practices. For example, Miles and Snow (1984) prefer a strategy model that involves hiring in the skills that are required, with little internal promotion and limited training programs.

The idea of a human resource management strategy being contingent on the business strategy and the commercial circumstances of the enterprise led to the notion of 'fit'. Here, human resource management has to fit both the external, strategic posture of the enterprise and also display internal organisational structural fit. The aim is for work to be designed to ensure that innovation occurs within an external strategic setting determined by the enterprise (external fit), while ensuring that individuals in the enterprise are allowed to innovate (internal fit). If successful, such an approach allows for building an ambidextrous innovative capacity, as argued by Tidd, Bessant and Pavitt (2005). Further, the notion of internal fit means human resource management practices have to fit together to ensure that one practice does not invalidate another practice (Baird & Meshoulam 1988). Thus, human resource management practices need to work together in self-reinforcing 'bundles' in order to provide maximum benefit to the enterprise (MacDuffie 1995), both for the strategic posture of the enterprise and maximising internal creative activities.

The notion of bundling human resource management practices has become very influential in formulating the current role of human resource management in enterprises. Using the work of Edith Penrose, who examined the way in which enterprises compete on resources (Penrose 1959), the resource-based view (RBV) of the enterprise builds on the notion of human resource 'bundles' to show that employees and their skills are the only real source of sustainable competitive advantage when other resources such as technology are easily imitated by competitors. Hamel and Prahalad (1994) describe this as a core competence for enterprises. Thus, the resource-based approach to human resource management emphasises the creation of unique dynamic bundles of capabilities based on the skills and attitudes of employees (Boxall & Purcell 2008). The role of human resource management is to nurture the human resource and to ensure that enterprises hold onto employees in order to build a bundle of dynamic capabilities that create sustainable competitive advantage for both steady-state and beyond-boundaries innovation.

From strategy to system

Recently, attention in human resource management research has switched from strategy towards the concept of 'high performance work' systems (for example, Colombo, Delamastro & Rabbiosi 2007). The emphasis on work systems as opposed to simpler human resource management practices emerged from the success of Japan in the 1980s, in this case, from the development of the Toyota Production System which was held responsible for the remarkable levels of productivity

achieved by Toyota and other Japanese manufactures in the 1990s (Womack, Jones & Roos 1990). High performance work systems blend human resource management practices, work design and the use of new technology, the latter being the point of contact with innovation. Specifically, Bélanger (2004) notes that high performance work systems embrace three concepts: production management (greater use of flexible quality production systems); work organisation (production processes based on knowledge, cognition and teamwork); and employee relations (harnessing employee commitment). Usually in these high performance work systems the human resource manager will be tasked with bundling a performance-based pay system that deploys the tacit skills of the workers for building capacity to innovate and which is realised in both steady-state and beyond-boundaries innovation.

Figure 2 The creative/learning organisation

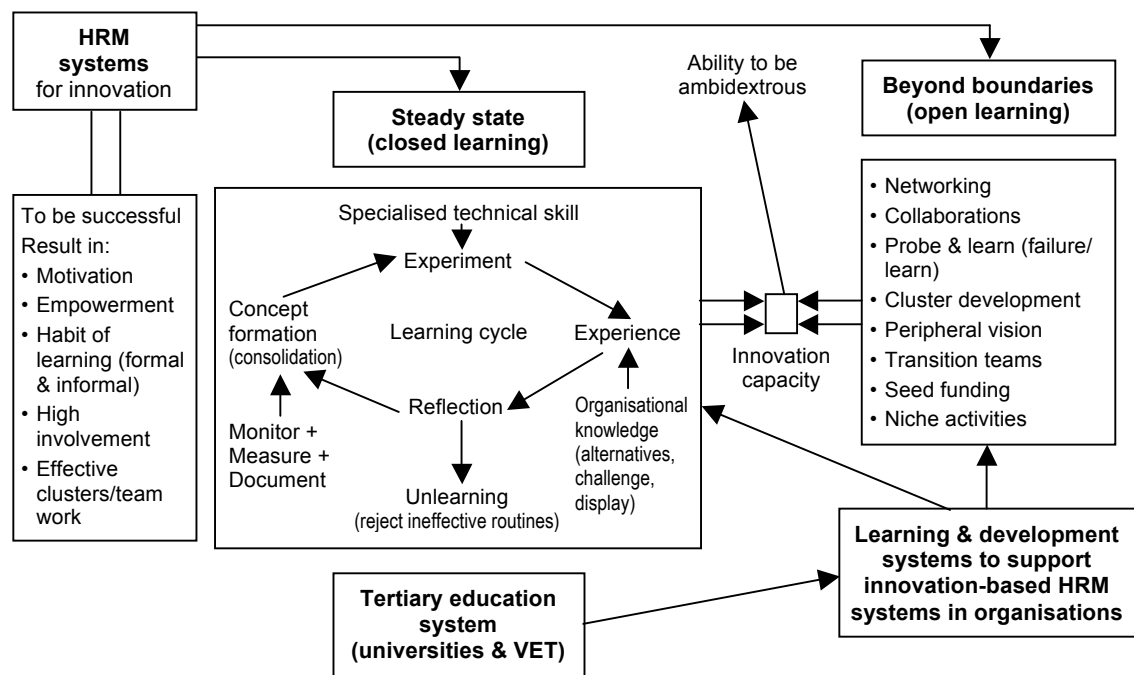


Figure 2 depicts creative/learning organisations utilising bundling human resource management practices which elicit skills in closed learning for steady-state innovation and open learning for beyond-boundaries innovation, with ‘ambidextrous’ being the ability to do both. The innovation implications of human resource management practices from this approach are discussed below.

Role of human resource management in innovation

There is very little empirical research that attempts to forge the links between human resource management and innovation at the enterprise level. The focus in this section is on that linkage. The research that has focused on the linkage aspect sees human resource management as a tool for managing innovation, rather than as a tool for promoting innovation (Becker & Matthews 2008; Birkinshaw, Hamel & Mol 2008). Many of the studies undertaken by innovation scholars examine innovation capability and its propensity to generate innovation performance (as described in the previous chapter), but do not investigate specifically the role of human resource management in building innovation capacity. This restricted view exists despite deep human resource management research on the strategic position for human resource management in enterprises. An integrated framework bringing together the work of human resource management and innovation scholars is only beginning to emerge (see, for example, de Leede & Looise 2005; Beugelsdijk 2008).

Recently, empirical studies by human resource management scholars have attempted to map innovation performance against human resource management practices. Jiménez-Jiménez and Sanz-Valle's (2005) study of a range of Spanish enterprises examines how an enterprise configures a human resource management strategy for innovation performance. In this study of 350 Spanish firms, they found that the Schuler and Jackson (1987) strategy model appears to result in higher levels of innovation performance amongst the firms in the sample. This finding confirms the importance of the strategic human resource management approach to innovation. However, the study also recognised the need for the 'soft' human resource management practices to create a stable and committed workforce willing to take risks (and learn from them) to further innovation. Thus, in the context of innovation performance, human resource management practice needs to incorporate both the soft and hard aspects of human resource management.

Another empirical study of Spanish firms by Perdomo-Ortiz, González-Benito and Galende (2009) examines the use of human resource management practices associated with total quality management (TQM), called 'human resource management TQM practices', and their impact on the innovation performance of enterprises. These include team working, extensive employee training, performance management and measures to increase the motivation of employees. In particular, the authors look at the use of these practices in bundles. Human resource management TQM practices are very similar in nature to the practices associated with high performance work systems, so the study presents a useful proxy for the impact of high performance work systems on innovation performance. The authors find a direct link between the use of bundles in high performance work systems practices and innovation performance. The strongest links in the study are between the use of teamwork (work organisation) and measures to increase worker motivation. There is also a weaker, direct link between the use of training and innovation (an issue discussed below).

In support of the macro framework presented in figure 1, there are studies which argue that the link between human resource management and innovation performance is not direct, but mediated through the creation of an organisational 'capacity' leading to innovation capability, which is in turn associated strongly with actual innovation performance. Lau and Ngo's (2004) study of Hong Kong firms is typical of these studies. Lau and Ngo examine the impact of specific human resource management practices—training, team development and performance-related pay on product innovation. From this empirical work, they theorise that it is the human resource management practices which create an organisational capacity centred on a developmental culture and which leads to higher levels of innovation performance. Consistent with figure 1, Lau and Ngo note only training as being linked directly to innovation performance, and that this relationship is rather weak. In essence, a developmental culture is an organisational culture in which individual development is encouraged and rewarded. Prajogo and Ahmed (2006) support this indirect view, establishing that the capacity for managing sophisticated technological and R&D knowledge from inside or outside the enterprise is the specific culture that induces innovative performances.

Possibly the most comprehensive work on human resource management and innovation has been undertaken in Denmark. Since the mid-1990s, the University of Aalborg has hosted the Danish Innovation System project (DISKO), which involves a regular survey of Danish private-sector enterprises and which aims to trace the relationship between technical and organisational innovation at the enterprise level. Laursen and Foss (2003) analyse the 1996 DISKO dataset to explore the links between innovation and human resource management. This study finds that the level of enterprise innovation is linked to the extent to which enterprises bundle their human resource management/high performance work systems practices, reflecting the importance of the bundling theory of high performance work systems discussed in the previous section. In particular, Laursen and Foss find a strong relationship between enterprise-level innovation and two forms of bundling of human resource management/high performance work systems practices. The first bundled system consists of interdisciplinary workgroups, quality circles, employee suggestion schemes, planned job rotation, delegation of responsibility, integration of functions, and performance-based pay. The second bundled system relates to training, discussed below. Thus, the study shows that human resource management practices, when implemented in a bundled fashion,

have a strong stimulus effect on innovation in the sample manufacturing firms. The DISKO research establishes that it is bundles of human resource management practices that are linked to innovation performance rather than individual practices.

From this section on human resource management/innovation studies, the strong evidence is that human resource management and innovation are linked more effectively by an inclusive bundle of human resource management practices. When the bundle is built around high performance work systems, this creates a culture or set of dynamic innovation capacities from which both steady-state and beyond-boundaries innovation capabilities spring, that lead to innovative performance (as specified in figure 1). However, the evidence is clear that human resource management practices on their own cannot enhance innovation performance directly.

Training and learning and development systems for innovation

This section examines the increasingly strong trend in enterprises for establishing internal learning and development systems with training for skills formation to provide support to their human resource management systems. Often enterprises appoint specific learning and development managers as distinct from human resource management managers. This review recognises the close link between human resource management and learning and development in developing human resource management stimuli for innovation. Learning and development in its simplest form is training as part of a work performance system, but a learning and development system is much more all-encompassing. Freel (2005) identifies training as a key learning and development activity for improving human capital, and notes that most innovative enterprises train more. However, Santamaría, Nieto and Barge-Gil (2009) note that few empirical studies have researched the impact of training practices on innovation, although they identify it as a key factor in low- and medium-technology industries. The research evidence examined in this section shows that training on its own has only a weak direct link to innovation, while it shows that extensive employee training has long been linked to the bundles of human resource management practices that constitute the high performance work systems approach to human resource management (MacDuffie & Kochan 1995; Osterman 1996); it is such bundles of human resource management practices that enhance innovation (Laursen & Foss 2003).

The research into the impact of human resource management on innovation provides evidence that the effect of training on innovation performance primarily comes when training is part of bundles of human resource management practices. Training is often seen as the 'litmus test' for the existence of high performance work systems, with a bundle of human resource management practices in place (Bélanger 2004). As a component of human resource management, training provision plays a salient role in innovation performance, as two recent studies confirm. Shipton et al. (2006) see human resource management practices as an important predictor of innovation, and thus recommend in-house training interventions as part of the learning focus of an enterprise. Lau and Ngo (2004) show that training plays a key role in the developmental culture of the enterprise and is the only single human resource management practice directly linked to higher levels of innovation performance. Thus, the role of training is crucial within a learning and development system as it appears to develop the knowledge and skills required at an individual level, producing higher levels of innovation and feeding into the creation of organisational cultures and management capabilities that sustain innovation. Laursen and Foss (2003), using the DISKO dataset, identify the learning and development system of an enterprise as the human resource management bundle that is based entirely on internal and external training provision. Laursen and Foss go on to show that the learning and development system, when internal and external training are implemented together, has a strong stimulus effect on innovation in service sector enterprises—especially information technology, retail and wholesale. The role of external training is discussed in the next section.

The limited research carried out in Australia since the mid-1990s shows that the nature of training has changed rapidly in response to both the new competitive environment and the changes in vocational education and training (VET) policy. Smith and Hayton (1999) developed a model to explain employer training in terms of the interaction of enterprise-level aspects influencing the decisions that enterprises take to train their employees. Research using this model identifies workplace change as the key driver for employer training (Smith et al. 2003). However, the actual form that training takes in enterprises is dependent on a series of variables unique to the enterprise, including its occupational structure, the industrial relations climate and the size of enterprise. These aspects moderate the way in which enterprises arrange training.

Smith et al. (2005) examine the impact of nationally recognised training on large Australian enterprises. In this study, the survey evidence shows that many larger enterprises are using competency standards in training packages to revise their own recruitment, selection, job classification, and performance management systems. Other enterprises re-design their internal training functions such that they become brokers rather than deliverers of training, with an emphasis on the ability of the training coordinators to navigate their way through the national VET system; this is in contrast to developing and delivering in-house programs of training. Training packages and the development of suites of qualifications for a large number of formerly untrained occupations are pulling together the three aspects of human resource management—training, career development and organisation development—into a single learning and development function within larger enterprises in Australia. This research by Smith et al. (2005) strongly suggests that learning and development is emerging as a field of practice which is quite different from the old training and development functions that used to dominate the training scene in Australian enterprises. An Australian case study example of this is the Melbourne training centre of the global Caterpillar mining company, which depicts in-house intervention as providing leading-edge practical training to its employees (Terziovski 2007). Thus, the emergence of the learning and development function with its internal emphasis on the integration of training with career and organisation development and business strategy on the one hand and the external VET system on the other constitutes a new learning and development system and is perhaps unique to Australian enterprises. Figure 2 illustrates how learning and development systems link to human resource management systems and tertiary education. This creates a need to investigate the role of learning and development systems in building innovation capacity.

In the new world of learning and development systems, the emphasis is on the learning opportunities afforded to individuals and groups in enterprises rather than on the provision of specific training initiatives. This has been referred to as a learning culture or a learning orientation in enterprises. Such a learning culture is reflected in Lau and Ngo's (2004) notion of the developmental culture which creates the innovative capacity identified by Prajogo and Ahmed (2006) and is mirrored by the concept of absorptive capacity (Cohen & Levinthal 1990). With the DISKO data and cross-referencing to market data for the period 1993–97, Vinding (2006) shows that absorptive capacity directly impacts on higher levels of innovation performance. Thus, learning via the learning culture developed by learning and development systems is a critical element in the growth of absorptive and innovative capacity. In Australian enterprises, this learning culture is linked to better human resource management outcomes in the form of reduced levels of employee turnover and higher levels of employee satisfaction (Smith, Oczkowski & Selby Smith forthcoming).

Lichtenthaler (2009) has taken the concept of absorptive capacity further and related it to different forms of learning in an enterprise. In Lichtenthaler's description, absorptive capacity consists of three forms of learning in the enterprise: (i) exploratory learning by recognising and assimilating knowledge and new technologies external to the enterprise; (ii) transformative learning with the ability to maintain prior knowledge and re-activate this learning when it is needed; and (iii) exploitative learning with the ability to transform and apply learning to exploit new market opportunities for the enterprise. This approach to absorptive capacity involves learning in its broadest sense—individual and organisational learning as well as knowledge management. In Lichtenthaler's model all three forms of learning need to be present in the enterprise, and all three

work together as a complementary bundle to ensure the development of absorptive (innovative) capacity to enable innovation performance. Thus, learning and development systems play a key role in developing innovative capacity.

The tertiary system and skills building for innovation

The success of Japanese industry from the 1970s onwards led to the abandonment of the big science model of radical innovation in preference to the competitive advantage model of incremental innovation. The focus in enterprises was on improving the quality and price performance of products. This involved innovation at all levels in enterprises rather than only in R&D departments. Mainstream operational managers had the task of driving innovation in all areas but, crucially, Japanese enterprises emphasised the role of employees in innovation through mechanisms such as continuous improvement programs and quality circles. The skills implications of this 'distributed model of innovation' are far greater than the linear, science-based models. In an environment of distributed innovation, all managers and workers require skills in innovation. This means the implementation of structured forms of on-the-job training which involve frequent job rotation and the use of teamwork to ensure that employees gain a variety of job skills and an understanding of the broader context of the enterprise's performance. As with Japanese approaches to high performance work systems, these systems were copied by Western enterprises during the 1990s, with the result that the model of distributed process innovation became the dominant way of thinking about innovation. Thus, as Tether et al. (2005, p.77) put it, '... innovation is much more distributed in the systemic model—basically all levels of skill are important and a sound basic education is the foundation upon which all adaptable, innovation-related skills are based'. It is on this basis that the competence-based skill formation in vocational tertiary education systems developed to support this distributed model of innovation.

Recent Australian studies of the relationship between the VET system and innovation have taken this distributed model of innovation and linked it to the role of training and education in innovation systems. Pickersgill (2005) provides a historical dimension to the role of VET assisting to create a unique incremental system of innovation in Australia. Toner et al. (2004) developed an index of innovation for enterprises based on R&D expenditure, capital investment in new plant and equipment and expenditure on structured training. By using a broad index of innovation, this allows a categorisation indicating that service industries can also be ranked highly on innovation, and that training plays a key role in the innovation process. Toner et al. (2004) conclude that training through the VET system plays a key role in innovation in the enterprise and that training for intermediate, trade-related skills is particularly important.

The new systems of learning and development that have evolved in Australia in recent years are based on the notion of the trainer as a broker rather than an instructor, taking into account the changes to the VET system in recent years, especially the development of training packages (Smith et al. 2005). Furthermore, the Smith et al. study reveals a major increase amongst large enterprises in the uptake of nationally recognised training due to the introduction of these training packages. Thus, in the new learning and development systems, learning and development sits between the public tertiary (university and VET) system and the internal human resource management practices of the enterprise (see figure 2). Frontier studies internationally show that process and organisational innovation are especially dependent on the broad public education and training of the workforce; for example, Jin and Stough (1998) emphasise the role of government in creating a learning infrastructure, while Beugelsdijk (2008) identifies training and schooling.

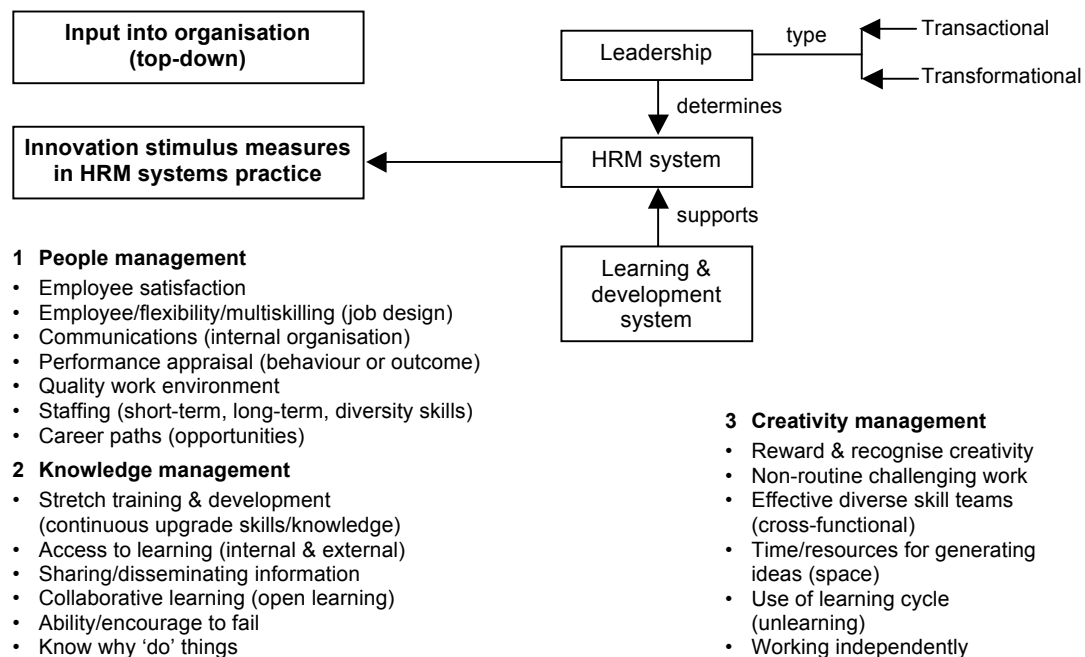
The development of training packages and the spread of new suites of qualifications to large groups of employees who formerly received little or no training play a very important part in the process of building for innovation. This is particularly true for lower-skilled workers in enterprises, who traditionally do not receive a fair share of training. However, new learning and development systems go further in supporting innovation than the extension of training to new groups in the

workforce. In fact, learning and development systems are leading the integration of human resource management/high performance work systems practices in enterprises and have been highlighted as a key element in both high performance working and innovation (Smith & Smith 2007). In some enterprises, the new learning and development systems ‘take over’ the broader human resource management function and facilitate the full integration of all human resource management/high performance work systems activities under the banner of employee development. If innovation at the enterprise level depends on the development of the dynamic capabilities and competencies of the enterprise, then the development of new learning and development systems under the stimulus of nationally recognised training will assist in achieving that end. Extending training to more groups of workers and by facilitating the integration of human resource management practices that are critical in building innovative capacity for dynamic capabilities in successful innovation will promote this.

The research framework— innovation stimulus

Figure 1 identifies, in a broad macro-business setting, two innovation stimuli as the factors that build innovation capacity. Figure 2 portrays the three systems of human capital formation (human resource management practices, learning and development system, tertiary education system) responsible for building innovative capacity at the workforce level, and which can be viewed as the human capital infrastructure allied to the technical R&D infrastructure. With these systems established, the task now is to examine the studies on how this human capital infrastructure is used to stimulate innovation capacity. Here we look at the measures that large enterprises can adopt to induce employees to be innovative. A micro-based research framework is developed in figure 3 and is used to describe the three human capital stimulus factors (and stimulus measures within these three factors) that specifically build workforce innovation capacity into an enterprise—people, knowledge and creativity management. This figure is an expansion of the top left-hand box of figure 1 and represents the core human capital measures that build innovation capacity in an enterprise. In this chapter, each of the three human capital factors identified in the research literature is examined in detail.

Figure 3 The research framework



The three factors that prompt innovative behaviour are discussed in an order that reflects the higher complexity of the task required to generate this behaviour. People management requires the inclusion, involvement and empowerment of employees within large organisations, which often seem bureaucratic and distant, to enable workers to be positively responsive to the issues that the enterprise is dealing with. Knowledge management aims to enhance the collection, dissemination and appropriation of information and ideas, which requires understanding the systems in place so that communication of issues and information is clear and effective. Creativity management aims to provide the creative spark that produces the original and problem-solving ideas to be developed,

that is, the source of innovation. It is the latter which inspiration for innovation comes from, and as such is the most complex of the factors discussed. The literature on the three factors comes from three diverse management areas that have rarely crossed paths, but which are together clearly identified and located in figure 3. Each is discussed separately in the following three sections. This is followed by a section that integrates the three through the examination of the small number of Australian studies on human capital stimuli.

People management

The management of innovation is in the first instance the physical management of the employees themselves (Angle 2000). Management practices need to create and maintain an environment that supports innovation, while employees need to not only be motivated to innovate, but also have opportunities to innovate (Kanter 1983; Angle 2000). Without such an environment, the higher-order management activities of knowledge and creativity are irrelevant. The innovation literature emphasises the importance of organisational culture as a determinant of innovation performance (Prajogo & Ahmed 2006), in other words ‘... organisations need to create and sustain conditions so that people want to innovate and so that people *can* innovate’ (Angle 2000, p.165, emphasis in original). Importantly, Lau and Ngo (2004, p.699) indicate that ‘[a]n innovation-oriented HR system has to rely on an appropriate organizational culture in order to have impacts on innovation’.

Key practices identified in the literature aimed at creating an organisational culture that thrives on innovative behaviour include empowerment and involvement. Kanter (1983) concludes that by ‘... encouraging innovation and entrepreneurship at all levels, by building an environment in which more people feel included, involved and empowered to take initiative, companies as well as individuals can be the masters of change instead of its victims’ (Kanter 1983, p.363). Thus, employees are an innovative enterprise’s necessary resource. Individuals play a fundamental role in the development of organisational learning (Lopez, Peon & Ordas 2006), and the evidence suggests that enterprises need to manage, motivate and reward employees to foster creativity and innovation. In general, people-management practices (or measures) identified in the literature which stimulate innovation include: human resource planning, teamwork and work organisation, performance appraisal, reward systems, career management and training. Each is discussed below.

Human resources planning

An enterprise needs to recruit, hire and retain the right employees—those who will contribute to organisational learning and innovation. Importantly, to foster innovation, enterprises need to recruit people with a variety of personal characteristics, knowledge, expertise and skills (Gupta & Singhal 1993; Mumford 2000), and selective hiring practices are found to be positively related to organisational learning (Lopez, Peon & Ordas 2006). Contrary to common belief, extremely low rates of turnover may be counterproductive for innovation, with variety highly restricted for the enterprise as it negotiates the future. Alternatively, high rates of turnover will be dysfunctional, due to costly changes in human and intellectual capital; thus moderate rates of turnover enhance diversity, critical evaluation and creativity (Guidice, Heames & Wang 2009). This indicates that management practices need to focus on job satisfaction to ensure turnover is not excessive. However, it is much more difficult to measure what exactly constitutes ‘over excessive’. A deep global recession (as in 2007–10) creates its own problems, as economic downturn forces much more turnover than during periods of boom economic conditions.

Teamwork and work organisation

As discussed in the previous chapter, the Perdomo-Ortiz, González-Benito and Galende (2009) study emphasises teamwork in association with human resource management TQM practices for promoting innovation performance. This study goes on to argue that enterprises:

should opt for supporting problem-solving practices in work teams; for designing incentives linked to forming part of these teams; for using methodologies such as quality circles or the creation of virtual communities; for including teamwork competencies as a hiring criterion and supporting an organisational design in which participation and delegation of functions are based on teamwork (p.1211).

Furthermore, it is suggested that cross-functional teams, extensively used by innovative enterprises, are critical for fostering creativity and innovation (Kanter 1983; Lau & Ngo 2004). Similarly, practices relating to job design can foster innovation. These practices include: allowing for employee flexibility, job rotation and multiskilling (see, for example, Laursen & Foss 2003; Cabrera, Collins & Salgado 2006; Beugelsdijk 2008). Overall, Lau and Ngo (2004) identify team development as instrumental in the creation of a culture of innovation. The challenge that Isaksen and Tidd (2006) clearly note is the delicate balance required to turn a loose collection of people in a 'group' into a mutually accountable and supportive 'team'. This is not easily done and should not be assumed to occur merely because a group of people have been put together.

Performance appraisal

Hoegl and Gemuenden (2001) argue that innovation success is linked to teamwork quality, including team performance and the personal success of team members. This indicates that performance appraisal at both individual and team levels is important for innovation. Performance appraisal to support innovation needs to evaluate progress in work processes and not outcomes (Mumford 2000); in other words to focus on behaviours not results (Gupta & Singhal 1993). From this it follows that process-based appraisals in innovative enterprises should be conducted more frequently than the usual annual appraisal (Gupta & Singhal 1993; Mumford 2000). The problem arises that such frequent appraisals may be very useful in bringing forth incremental innovation, but radical innovation that goes beyond boundaries is much more complex and does not arise in any regular way that can be frequently appraised.

Reward systems

Rewards and incentives to promote innovation go beyond traditional compensation systems. To promote innovation, Lopez, Peon and Ordas (2006) suggest that rewards and incentives should reinforce risk-taking and stimulate knowledge exchange and sharing among group members. Employee reward systems identified in innovative enterprises include both financial rewards and non-financial rewards, such as freedom and autonomy (Gupta & Singhal 1993). From this, Gupta and Singhal (1993) find that reward and remuneration practices that support innovation include the provision of freedom for creativity, financial rewards, promotions and other recognition. As well, given the importance of team-based activities for innovation, group-based incentives which reinforce cooperation between members may also be required (Lopez, Peon & Ordas 2006). Thus, managers need to find an appropriate balance between team and individual rewards. An integrative approach is proposed by other researchers who argue that '... workers' performance is substantially better under incentive pay plans that are coupled with supporting innovative work practices' (Ichniowski, Shaw & Prennushi 1997, pp.311–12). Incentives can vary in their impacts on radical and incremental innovation. In particular, Beugelsdijk (2008) reveals that performance-based pay has a positive effect on incremental innovation but not radical innovation, and that in combination with task rotation or flexible working hours it may even have a negative effect on radical innovation. Thus, reward-based stimulus can boost steady-state dynamic capabilities, but to the detriment of beyond-boundaries dynamic capabilities.

Career management and training

Employee development practices which maximise employees' commitment to innovation are recommended; this involves practices such as career management, mentoring and coaching (Lopez-Cabral, Pérez-Luño & Cabrera 2009). Also recommended for stimulating innovation amongst employees is the establishment of career paths which involve various job opportunities beyond the confines of a single expertise (Kang, Morris & Snell 2007). Management practices which provide career-based incentives for ongoing knowledge development are likely to contribute to innovation (Mumford 2000). Further, in addition to enhancing knowledge management, '... there is clear evidence that training is positively associated with job satisfaction' (Jones et al. 2009) and innovation is significantly associated with on-the-job training (Zeytinoglu & Cooke 2009). However, as discussed in the previous chapter, training on its own provides only a weak link to innovation and needs to be bundled with other people-management practices to be effective in the innovation goal.

In summary, for building innovation capacity, people management requires a commitment-based bundle of practices (Collins & Smith 2006) that facilitate employee cooperation and involvement (Cabrera, Collins & Salgado 2006) and which emphasise the valuing and support of employees (Kanter 1983), leading to an innovative and entrepreneurial culture (Lau & Ngo 2004, p.698). Such an employee-based culture is the first human capital stimulus to building innovation capacity.

Knowledge management

Knowledge management is the second human capital stimulus by which enterprises can enhance their capacity to innovate. Carneiro (2000) argues that an organisation's knowledge is only an asset if used efficiently and continually enhanced. The importance of knowledge management to innovation is further emphasised by the fact that knowledge can increase in value with use (Carneiro 2000) and that human capital advantages can decrease over time (Lopez-Cabral, Pérez-Luño & Cabrera 2009).

To effectively work through the innovation process requires harnessing new and unique knowledge at each of the sub-processes (Nonaka & Takeuchi 1995). This begins with harnessing knowledge to create the initial innovation idea (imagining), and moves through to incubating and demonstrating the idea using a specific project management team. Knowledge-based absorptive capacity identifies the extent to which an enterprise has this harnessing power. Thus, an enterprise's potential for innovation is dependent upon the prior accumulation of knowledge (Fiol 1996). Nonaka and Takeuchi (1995) distinguish between tacit knowledge ('know-how') and explicit knowledge ('know-what' and 'know-why'), while arguing that the key to organisational knowledge creation, and thus innovation, is the mobilisation and conversion of tacit into explicit knowledge. In a seminal paper, Nonaka and Konno (1998) develop this further as the concept of *Ba* (Japanese for 'place'), in which *Ba* is the provision of shared spaces in an enterprise—physical (for example, staff room), virtual (for example, intranet), mental (for example, shared experiences)—where knowledge is embedded. This *Ba* enables the transformation of embedded knowledge back from explicit into tacit through the process of practice. Such internalisation of knowledge is characterised by collective thinking in communities of practice, where networks (both real and virtual) provide the launching pad for organisational learning (Wenger 1998).

Types of knowledge

There are three types of knowledge identified in the intellectual capital literature: human, organisational and social (Subramaniam & Youndt 2005). These are defined as follows: human capital, which is the knowledge, skills, and abilities individuals have and utilise; organisational capital, the institutionalised knowledge and experience encapsulated in, and used through, sources like databases, manuals, systems and patents; and social capital, the knowledge embedded in, accessible through, and utilised by interactions amongst individuals through their networks of

interrelationships (Lopez-Cabral, Pérez-Luño & Cabrera 2009). Importantly, how each component of intellectual capital accumulates and distributes knowledge differs—human capital through individuals; organisational capital through organisational processes, structures and systems; and social capital through networks and relationships (Subramaniam & Youndt 2005; Lopez-Cabral, Pérez-Luño & Cabrera 2009).

Each of the three types of knowledge necessitates unique kinds of investment. Investment in human capital requires a focus on people management and training individuals; organisational capital requires the establishment of devices and systems for storage and dissemination of knowledge; and social capital requires the development of means to facilitate collaboration, interactions and relationships. Despite these differences, within enterprises various aspects of intellectual capital and their interrelationships contribute to the deployment of organisational knowledge for learning and thus innovation, since ‘... innovations essentially draw upon such deployed knowledge’ (Subramaniam & Youndt 2005, p.452).

Human capital is inextricably tied to social capital. Thus, in order to realise the full potential of employees and therefore enhance the innovative capabilities of the enterprise, synergies between the organisation’s human and social capital need to be created (Subramaniam & Youndt 2005; Kang, Morris & Snell 2007). So, enterprises need to ensure that human resource management practices are not only aimed at developing employees’ skills and the expertise that supports steady-state capabilities, but also the activities which aim to develop their abilities to collaborate, network and share knowledge to enhance learning and innovation that support beyond-boundaries capabilities (Subramaniam & Youndt 2005).

Knowledge management has been empirically linked to both incremental and radical innovation (Darroch & McNaughton 2002). Practices empirically identified with managing knowledge include the need for enterprises to stimulate and improve the awareness of their human capital, while providing opportunities for employees to communicate and share information (Prajogo & Ahmed 2006). Knowledge-based human resource practices which enable innovation include appraisal and compensation practices (Lopez-Cabral, Pérez-Luño & Cabrera 2009), as well as incentives that encourage ongoing knowledge development and access to learning, both internal and external (Mumford 2000), which were reviewed under people management.

Collaborative human resource management practices for collective thinking increase the uniqueness of knowledge and are critical for disseminating knowledge through the enterprise. These practices include training and selection for teamwork skills, communication mechanisms, exchange programs (Lopez-Cabral, Pérez-Luño & Cabrera 2009) and orientation and socialisation programs, team-building activities, group training, mentoring and on-the-job training (Kang, Morris & Snell 2007). In order to build innovative capacity, such collaborative human resource management practices need to incorporate in their design ‘double loop’ adaptive learning (Bessant & Caffyn 1996). An important aspect of adaptive learning is tolerating mistakes and/or failures, which in this context have a teaching role, thus enhancing knowledge and innovation (Nonaka & Takeuchi 1995). In other words, collaborative decisions and adaptive learning by employees on projects, with success and failures, come from reflective practice (Kolb 1984), but mistakes can create tension and panic in the world of uncertainty which innovation and change inhabit (Courvisanos 1996, p.190). Knowledge management requires a robust and honest assessment of decisions and actions.

In summary, knowledge management is not only concerned with enabling creative ideas for innovation to percolate through the organisation, but also with providing the human resource stimuli, practices, and actions that drive innovation (Prajogo & Ahmed 2006) to bring such new ideas to fruition. In particular, ‘... the importance for organizations to develop managerial practices and actions that function as a stimulus for encouraging and energizing people to innovate through development and accumulation of ideas and knowledge’ (Prajogo & Ahmed 2006, p.503) is evident.

Creativity management

‘Creativity is the ability of an individual to generate new ideas or to conceive of new perspectives on existing ideas’ (Barney & Griffin 1992, p.281); it is a necessary but not sufficient condition for innovation (Mumford 2000). Amabile (1997) identifies creativity as the actual generation of new and useful ideas, while innovation is the successful implementation of such creative ideas. The differentiation between creativity and innovation is critical to human resource management scholars and practitioners, because it is the management of employees in the enterprise that elicits such creativity (McLean 2005, p.228). Creativity is primarily viewed as operating at an individual level, in contrast to innovation, which, by necessity, has to operate at the group and organisational levels (McLean 2005). It is the individual who comes up with the novel idea (‘problem-solver’) and the individual, also, is the champion (or internal entrepreneur, ‘intrapreneur’) who starts up the process to get it through the enterprise. At implementation the organisational processes take over. Thus, the individual needs to be supported by the organisation, first by the provision of mechanisms for developing new ideas, and then by backing the ideas through organisational implementation (Amabile 1997).

Although ‘... it is important to understand the context in which the individual creator functions’ (McLean 2005, p.226), little empirical work has been undertaken in the area of the organisational culture relating to creativity and innovation (Oldham & Cummings 1996; McLean 2005). In contrast to the traditional approach to creativity, with its focus on the creative individual, Amabile (1983) explains that creative work is not limited to so-called creative employees and that the work environment can influence creative behaviour. Assessing the work environment for creativity, Amabile et al. (1996) identify the need for a supportive environment and the environmental issues which affect an individual’s inclination for creativity, including group/team climate, freedom, autonomy, supervisor support and rewards.

Major elements influencing individual creativity

To foster creativity within an enterprise requires managers to not only pay attention to what sort of individuals they hire, but also to the environments which they create for employees (Amabile et al. 1996). Building on her theory of individual creativity, Amabile (1997) proposes that the major elements which influence individual creativity include expertise (‘knowledge—technical, procedural, and intellectual’), creative skills and task motivation, and the impact of the organisational (work) environment on creativity. These are resources, management practices and organisational motivation. Further, Amabile (1997) stresses that, although expertise and creative skills determine creative ability, it is the task motivation component which determines what an individual will actually do. Task motivation is therefore necessary for creativity. However, she differentiates between intrinsic motivation (internal personal desire to create) and extrinsic motivation (organisational recognition and rewards to create) and explains that, while intrinsic motivation enhances creativity, extrinsic motivation, if not supportive of the creative process, may in fact hamper (or not stimulate) creativity. Other researchers, by acknowledging the possible negative effects of extrinsic motivation, argue that an enterprise needs to establish positive extrinsic motivation to support the transformation of creative ideas into an innovation (Glynn 1996; Prajogo & Ahmed 2006). This is the essence of creativity management.

Not only is time required to think and be creative (Mumford 2000), creativity also requires other organisational resources for generating new ideas (McLean 2005). Employees need space to be ‘beyond boundaries’ creative without feeling that this space impinges on their standard operations or ‘steady state’ learning. For this they need both resources and opportunities (Prajogo & Ahmed 2006). Empowerment and involvement are identified as key practices which can build innovative behaviours (Prajogo & Ahmed 2006). Empowerment arises from respect for individuals in the enterprise (Kanter 1983), freedom and autonomy (McLean 2005) and flexible work schedules (Mumford 2000). Involvement through effective, diverse and cross-functional skill teams is recognised as improving creativity (Kanter 1983), in part, as a result of improved information-

sharing and collective thinking using the *Ba* concept, identified as the most important tools for improving creativity (Nonaka & Takeuchi 1995).

Human resource practices affecting creativity

Six categories of human resource practices which affect creativity have emerged from the research by Amabile and her co-researchers; these are: challenge, freedom, resources, work-group features, supervisory encouragement and organisational support. Human resource management practices that impinge on these categories can encourage and support creativity, or they can stifle and, indeed, kill creativity. Amabile and her colleagues (Amabile et al. 1996; Amabile, 1997, 1998; Amabile, Hadley & Kramer 2002) have identified how management of these six categories requires a balancing act to maximise creativity without ‘overloading’ or ‘underloading’ the creative process.

The major organisational factor identified in the literature as an impediment to effective creativity management, and thus innovation, is control (Kanter 1983; Amabile et al. 1996; McLean 2005). A culture that supports and encourages control, whether it is in decision-making or information flows, or perceived control through reward systems, may place too much emphasis on increasing extrinsic motivation to the detriment of the intrinsic motivation necessary for creativity (Amabile 1997). Control barriers to creativity identified include top management isolation, intolerance of differences, short time horizons, overly rational thinking, inappropriate incentives and excessive bureaucracy (Roffe 1999). Control can also subtly produce tension, with heightened stress (or distress), through overexposure to complex tasks. Health psychology studies on work show that such tension has a negative effect on an individual’s ability to plan and to commit to work in the long term (Davidson, Cooper & Baldini 1995; Benavides, Benach & Muntaner 2002; Schabracq, Winnubust & Cooper 2003). Thus, organisational management needs a balanced approach to opposites to encourage creativity: underload vs overload stress; excessive time vs unlimited time pressure; independence vs teamwork; restrictive vs excessive financial resources; diverse vs homogenous teams; intrinsic vs extrinsic rewards; organisational support vs control; and consensus vs conflict in decision-making.

From the list of opposites emerge two central aspects in the creativity management of employees. One is recognition that such ‘balance’ is difficult, with no single enterprise having the magic formula. The balance should be seen more as a critical ‘trade-off’ in each specific corporate environment. The trade-off between under- and overload in each enterprise needs to be assessed in the context of the most effective ‘creative climate’ that an enterprise is able to build to propagate the initiation of innovation capacity. Isaksen and Bessant (2006) identify six creative climate aspects that need appropriate trade-offs in order to influence innovation: trust and openness; challenge and involvement; support and space; conflict and debate; risk-taking; and freedom. The other view is that these six aspects to a creative climate need to be integrated into self-organising systems with internal dynamics that allow increasing complexity to be stabilised without external guidance. Thus, Howkins (2009) argues for developing ‘creative ecologies’ in organisations that can achieve this balance (or appropriate trade-off). But, let’s not be under any illusion that such creative climates and ecologies are easy to achieve. Given the long history of bureaucratic and more recently incremental training approaches to human capital formation in Australia, the corporate employee environment is a long way from such creative ecologies. Indicative of this is the total lack of any human resource-based research studies in Australia on creativity management.

Australian studies on human capital stimuli

Despite the significant body of research on the three human capital stimuli that operate on innovation outlined in this chapter, the lack of Australian studies in this area is clearly evident. The Australian human resource management research discussed in the previous chapter has focused specifically on training, with extensions to learning and development systems and collaborations with universities at the ‘big science’ end of business enterprises. On the human actors—particularly

in the context of stimuli for innovation capacity—Australian research is non-existent. Symptomatic of this human capital lacuna in innovation research are three recent studies on Australian firms. Jones and Pagan (1999) examined 150 innovative Australian firms that were heavily biased towards new growth industries dominated by foreign-owned companies in ICT, biotechnology, health and medical technologies, food and beverages, mining and minerals. What was noteworthy in this study is that innovation was found in firms of all sizes, and was not associated specifically with large enterprises. This is further supported by Matthews (2002), who conducted a case study of ten small-to-medium-sized firms in ‘big science’ that were linked to universities and other research institutions like CSIRO. Such ‘big science’ studies have embedded highly skilled human capital as a given, and thus lack broad relevance from a human resource management perspective. Terzioski’s (2007) multi-country case studies included one Australian operation, a large global Caterpillar mining firm. However, human resource management was only a part of an investigation of its innovative capabilities, with people, knowledge and creativity management being only three of eight factors, and no human resource management framework to understand how the firm built this capacity to realise such dynamic capability.

As has been noted by two broad-based management reports for the Australian Government in Karpin (1995), and ten years later by Green (2009), medium and large enterprises in Australia are not particularly noted for their innovative behaviour. Green (2009, p.23) notes that these firms are stronger in their conduct of operations management than of people management, but with firms in high-skill environments having better human capital management practices than those in low-skill environments. As Green (2009, p.17) concludes: ‘Moving forward, Australian businesses must improve their human resource-related practices with a target of attracting, retaining and promoting best talent and more importantly addressing poor performance’. This conclusion is the start of the study being conducted with the current literature review as its foundation.

Conclusion

This review of the literature on innovation and human resource management used the Stimulus-Capacity-Performance framework to investigate the factors that impact on innovation in an enterprise (figure 1). In this macro framework we identified human and technological factors as the two major stimuli that enhance (or if poorly performed, inhibit) innovation capacity in enterprises. The focus of this review was on the human factors and, in particular, the role of human capital formation in linking with technological factors to build upon creative ideas to realise the significant innovative outcomes necessary for yielding sustainable competitive advantage for enterprises (Porter 1980).

Since employees are an enterprise's most vital and necessary resource in delivering innovative outcomes, there needs to be careful study of *all* the human capital formation stimulus factors identified in this paper (people, knowledge, creativity) which in combination build innovation capacity towards innovative performance. There is much detailed research on various aspects of building this capacity that draws on a wide range of discipline areas: studies on organisational development and human resource management; educational research on training and learning and development; science, and innovation systems studies on knowledge management; psychological studies on stress; and creative work behaviour. However until now, there has been no study which has attempted to draw these diverse studies together into one coherent approach to building innovation capacity in enterprises. This is the aim of the research project flowing from this review of the literature.

Any analysis of the role of human resource management in innovation needs to identify not only the human resource management practices and systems with the capacity to prompt innovation, but also two ancillary services. One is the learning and development system, which must go beyond training and create learning or developmental cultures in enterprises; the other is the tertiary education system, which, with the spread of nationally recognised training, is playing an increasingly important role in the new learning and development systems of enterprises. Figure 2 depicts the interaction of these three systems—the human resource management system, the tertiary education system and the learning and development systems—in building innovative capacity to facilitate closed (for steady-state innovation) and open (for beyond-boundaries innovation) learning to inform the five sub-processes of the innovation-commercialisation cycle: imagining, incubating, demonstrating, promoting and sustaining.

The human resource management stimulus measures encompassed by the people, knowledge and creativity management factors are set out in figure 3, which will guide the research project through an analysis of these three key factors. What is needed is the creation of unique and dynamic bundles of human resource capabilities based on the skills and attitudes of employees; the crucial element here is a human capital formation strategy within the enterprise designed to build innovation capacity. In essence, this represents a fine balance between managing the risk and uncertainty associated with overload and underload that any modern enterprise needs to achieve in the process of forming an innovative human resource base that generates an adequately 'good' amount of stress, or 'eustress' (Le Fevre, Matheny & Kolt 2003).

The theoretical framework developed as a result of this review will form the basis of the empirical investigation on the nature of human capital formation in medium-to-large Australian enterprises in the next phase of this research project. This will then allow a clear course for building innovation capacity with the human resources in these Australian enterprises to be charted.

References

- Ahamed, SV & Lawrence, VB 2005, *The art of scientific innovation: cases of classical creativity*, Pearson Prentice-Hall, Upper Saddle River, NJ.
- Ahmed, PK 1998, 'Benchmarking innovation best practice', *Benchmarking for Quality Management & Technology*, vol.5, no.1, pp.45–58.
- Amabile, TM 1983, 'The social psychology of creativity: a componential conceptualization', *Journal of Personality and Social Psychology*, vol.45, no.2, pp.357–76.
- 1997, 'Motivating creativity in organizations: on doing what you love and doing what you do', *California Management Review*, vol.40, no.1, pp.39–58.
- 1998, 'How to kill creativity', *Harvard Business Review*, vol.76, no.5, pp.77–87.
- Amabile, TM, Conti, R, Coon, H, Lazenby, J & Herron, M 1996, 'Assessing the work environment for creativity', *Academy of Management Journal*, vol.39, no.5, pp.1154–84.
- Amabile, TM, Hadley, CN & Kramer, SJ 2002, 'Creativity under the gun', *Harvard Business Review*, vol.80, no.8, pp.52–61.
- Angle, HL 2000, 'Psychology and organizational innovation', in *Research on the management of innovation: the Minnesota studies* [electronic resource], eds AH Van de Ven, H Angle & MS Poole, Oxford University Press, Oxford, pp.135–70.
- Baird, L & Meshoulam, I 1988, 'Managing two fits of strategic human resource management', *Academy of Management Review*, vol.13, no.1, pp.116–28.
- Barney, JB 1991, 'Firm resources and sustained competitive advantage', *Journal of Management*, vol.17, no.1, pp.99–120.
- Barney, JB & Griffin, RW 1992, *The management of organizations: strategy, structure, behavior*, Houghton Mifflin Co., Boston.
- Becker, KL & Matthews, JH 2008, 'Linking human resource management and innovation: formulating the research agenda', paper presented at the 22nd ANZAM Conference 2008: *Managing in the Pacific century*, 2008, 2–5 December, Auckland, New Zealand.
- Beer, M, Spector, B, Lawrence, PR, Mills, D & Walton, R 1984, *Managing human assets*, The Free Press, New York.
- Bélanger, M 2004, 'Work-based distributed learning', in *Encyclopedia of distributed learning*, eds A Distefano, KE Rudestam & RJ Silverman, Sage Publications, Thousand Oaks, California, pp.493–6.
- Benavides, FG, Benach, J & Muntaner, C 2002, 'Psychological risk factors at the workplace: is there enough evidence to establish reference values?', *Journal of Epidemiology and Community Health*, vol.56, no.4, pp.244–5.
- Bessant, J & Caffyn, S 1996, 'Learning to manage innovation', *Technology Analysis and Strategic Management*, vol.8, no.1, pp.59–70.
- Best, M 1990, *The new competition: institutions of industrial restructuring*, Polity Press, Cambridge.
- Beugelsdijk, S 2008, 'Strategic human resource practices and product innovation', *Organization Studies*, vol.29, no.6, June 1, 2008, pp.821–847.
- Birkinshaw, J, Hamel, G & Mol, MJ 2008, 'Management innovation', *Academy of Management Review*, vol.33, no.4, pp.825–45.
- Boxall, P & Purcell, J 2008, *Strategy and human resource management*, 2nd edn, Palgrave Macmillan, London.
- Brown, WB & Karagozoglu, N 1993, 'Leading the way to faster new product development', *Academy of Management Executive*, vol.7, no.1, pp.36–47.
- Cabrera, Á, Collins, WC & Salgado, JF 2006, 'Determinants of individual engagement in knowledge sharing', *International Journal of Human Resource Management*, vol.17, no.2, pp.245–64.
- Carneiro, A 2000, 'How does knowledge management influence innovation and competitiveness?', *Journal of Knowledge Management*, vol.4, no.2, pp.87–98.
- Christensen, C & Raynor, M 2003, *The innovator's solution: creating and sustaining successful growth*, Harvard Business School Press, Boston, MA.
- Christiansen, JA 2000, *Building the innovative organization*, Macmillan, London.
- Cohen, WM & Levinthal, DA 1989, 'Innovation and learning: the two faces of R and D', *Economic Journal*, vol.99, no.397, pp.569–96.

- 1990, 'Absorptive capacity: A new perspective on learning and innovation', *Administrative Science Quarterly*, vol.35, no.1, pp.128–52.
- Collins, CJ & Smith, KG 2006, 'Knowledge exchange and combination: the role of human resource practices in the performance of high technology firms', *Academy of Management Journal*, vol.49, no.3, pp.544–60.
- Colombo, M, Delmastro, M & Rabbiosi, L 2007, 'High performance work practices, decentralisation, and profitability: evidence from panel data', *Industrial and Corporate Change*, vol.16, no.6, pp.1037–67.
- Courvisanos, J 1996, *Investment cycles in capitalist economies*, Edward Elgar, Cheltenham and Brookfield.
- 2007, 'The ontology of innovation: human agency in the pursuit of novelty', *History of Economics Review*, vol.45, Winter, pp.41–59.
- Curtain, R 2004, *Vocational education and training, innovation and globalisation*, NCVER, Adelaide.
- Cutler, TC 2008, *Venturous Australia report: building strength in innovation*, Cutler and Company, North Melbourne.
- Darroch, J & McNaughton, R 2002, 'Examining the link between knowledge management practices and types of innovation', *Journal of Intellectual Capital*, vol.3, no.3, pp.210–22.
- Davidson, M, Cooper, C & Baldini, V 1995, 'Occupational stress in female and male graduate managers', *Stress Medicine*, vol.11, no.1, pp.157–75.
- Dawe, S 2004 (ed.), *Vocational education and training and innovation: research readings*, NCVER, Adelaide.
- de Leede, J & Looise, JK 2005, 'Innovation and human resource management: towards an integrated framework', *Creativity & Innovation Management*, vol.14, no.2, pp.108–17.
- Department of Trade and Industry (UK) 2003, *Competing in the global economy: the innovation challenge*, DTI, London.
- Dussauge, P, Hart, S & Ramanantsoa, B 1992, *Strategic technology management*, John Wiley & Sons Ltd, Paris.
- Fiol, CM 1996, 'Squeezing harder doesn't always work: continuing the search for consistency in innovation research', *Academy of Management Review*, vol.21, no.4, pp.1012–21.
- Fombrun, CJ, Tichy, NM & Devanna, MA 1984, *Strategic human resource management*, Wiley, New York.
- Freel, MS 2005, 'Patterns of innovation and skills in small firms', *Technovation*, vol.25, no.2, pp.123–34.
- Garlick, S 1998, 'Creative associations in special places': enhancing the partnership role of universities in building competitive regional economies, Evaluations and Investigations Programme, Higher Education Division 98/4, Commonwealth of Australia, Department of Employment, Education, Training and Youth Affairs, Canberra.
- Garlick, S, Taylor, M & Plummer, P 2007, *An enterprising approach to regional growth: implications for policy and the role of vocational education and training*, NCVER, Adelaide.
- Glynn, MA 1996, 'Innovative genius: a framework for relating individual and organizational intelligences to innovation', *Academy of Management Review*, vol.21, no.4, pp.1081–111.
- Green, R 2009, *Management matters in Australia: just how productive are we?* Commonwealth of Australia, Department of Innovation, Industry, Science and Research, Canberra.
- Guest, DE 1987, 'Human resource management and industrial relations', *Journal of Management Studies*, vol.24, no.5, pp.503–21.
- Guidice, RM, Heames, JT & Wang, S 2009, 'The indirect relationship between organizational-level knowledge worker turnover and innovation', *The Learning Organization*, vol.16, no.2, pp.143–67.
- Gupta, AK & Singhal, A 1993, 'Managing human resources for innovation and creativity', *Research Technology Management*, vol.36, no.3, pp.41–8.
- Hamel, G & Prahalad, CK 1994, *Competing for the future*, Harvard Business School Press, Boston, MA.
- Hauser, M 1998, 'Organizational culture and innovation of firms – an integrative view', *International Journal of Technology Management*, vol.16, nos1–3, pp.239–55.
- Hoegl, M & Gemuenden, HG 2001, 'Teamwork quality and the success of innovative projects: a theoretical concept and empirical evidence', *Organization Science*, vol.12, no.4, pp.435–49.
- Howkins, J 2009, *Creative ecologies*, University of Queensland Press, Brisbane.
- Ichniowski, C, Shaw, K & Prennushi, G 1997, 'The effects of human resource management practices on productivity: a study of steel finishing lines', *The American Economic Review*, vol.87, no.3, pp.291–313.
- Isaksen, S & Tidd, J 2006, *Meeting the innovation challenge*, John Wiley & Sons, Chichester.
- Jin, DJ & Stough, RR 1998, 'Learning and learning capability in the fordist and post-fordist age: an integrative framework', *Environment and Planning A*, vol.30, pp. 1255–78.
- Jimenez-Jimenez, D 2008, 'Could human resource management support organizational innovation?', *International Journal of Human Resource Management*, vol.19, no.7, pp.1208–221.
- Jimenez-Jimenez, D & Sanz-Valle, R 2005, 'Innovation and human resource management fit: an empirical study', *International Journal of Manpower*, vol.26, no.4, pp.364–81.
- Jolly, VK 1997, *Commercializing new technologies: getting from mind to market*, Harvard Business School Press, Boston, MA.
- Jones, AJ & Pagan, J 1999, *Case studies on innovative Australian firms: some examples*, Innovation Systems Research, Commonwealth of Australia, Department of Industry, Science and Resources, Canberra.

- Jones, MK, Jones, RJ, Latreille, PL & Sloane, PJ 2009, 'Training, job satisfaction, and workplace performance in Britain: evidence from WERS 2004', *Labour*, vol.23, no.1, pp.139–75.
- Kalecki, M 1954, *Theory of economic dynamics: an essay on cyclical and long-run changes in capitalist economy*, Allen & Unwin, London.
- Kang, SC, Morris, SS & Snell, SA 2007, 'Relational archetypes, organizational learning, and value creation: extending the human resource architecture', *Academy of Management Review*, vol.32, no.1, pp.236–56.
- Kanter, RM 1983, *The change masters: innovation and entrepreneurship in the American corporation*, Simon & Schuster, New York.
- Karpin, D (Chair) 1995, *Enterprising nation: report of the Industry Task Force on Leadership and Management Skills*, Commonwealth of Australia, Canberra.
- Kolb, DA 1984, *Experiential learning experience as a source of learning and development*, Prentice Hall, Englewood Cliffs, NJ.
- Lau, C & Ngo, H 2004, 'The HR system, organizational culture, and product innovation', *International Business Review*, vol.13, no.6, pp.685–703.
- Laursen, K & Foss, NJ 2003, 'New human resource management practices, complementarities and the impact on innovation performance', *Cambridge Journal of Economics*, vol.27, no.2, pp.243–63.
- Le Fevre, M, Matheny, J & Kolt, SJ 2003, 'Eustress, distress and interpretation in occupational stress', *Journal of Managerial Psychology*, vol.18, no.7, pp.726–44.
- Legge, K 1995, *Human resource management: rhetorics and realities*, Macmillan, London.
- Lichtenthaler, U 2009, 'Absorptive capacity, environmental turbulence, and the complementarity of organizational learning processes', *Academy of Management Journal*, vol.52, no.4, pp.822–46.
- Lopez-Cabral, A, Pérez-Luño, A & Cabrera, RV 2009, 'Knowledge as a mediator between human resource management practices and innovative activity', *Human Resource Management*, vol.48, no.4, pp.485–503.
- Lopez, SP, Peon, JMM & Ordas, CJV 2006, 'Human resource management as a determining factor in organizational learning', *Management Learning*, vol.37, no.2, pp.215–39.
- Matthews, J. 2002, 'Innovation in Australian small and medium enterprises: contributions from strategic human resource management', *Asia Pacific Journal of Human Resources*, vol.40, no.2, pp.193–204.
- MacDuffie, JP 1995, 'Human resource bundles and manufacturing performance: organizational logic and flexible production systems in the world auto industry', *Industrial & Labor Relations Review*, vol.48, no.2, pp.197–221.
- MacDuffie, JP & Kochan, TA 1995, 'Do U.S. firms invest less in human resources? Training in the world auto industry', *Industrial Relations*, vol.34, no.2, pp.147–68.
- McLean, LD 2005, 'Organizational culture's influence on creativity and innovation: a review of the literature and implications for human resource development', *Advances in Developing Human Resources*, vol.7, no.2, pp.226–46.
- Michie, J & Sheehan, M 1999, 'Human resource management practices, R&D expenditure and innovative investment: evidence for the UK's 1990 workplace industrial relations survey', *Industrial and Corporate Change*, vol.8, no.2, pp.211–34.
- Miles, RE & Snow, CC 1984, 'Designing strategic human resources systems', *Organizational Dynamics*, vol.13, no.1, pp.36–52.
- Mumford, MD 2000, 'Managing creative people: strategies and tactics for innovation', *Human Resource Management Review*, vol.10, no.3, pp.313–51.
- Nonaka, I & Konno, N 1998, 'The concept of 'Ba': building a foundation for knowledge creation', *California Management Review*, vol.40, no.3, pp.40–54.
- Nonaka, I & Takeuchi, H 1995, *The knowledge-creating company: how Japanese companies create the dynamics of innovation*, Oxford University Press, New York.
- Oakley, A 2002, *Reconstructing economic theory: the problem of human agency*, Edward Elgar, Cheltenham, UK.
- Oldham, GR & Cummings, A 1996, 'Employee creativity: personal and contextual factors at work', *Academy of Management Journal*, vol.39, no.3, pp.607–34.
- Osterman, P 1996, *Broken ladders: managerial careers in the new economy*, Oxford University Press, New York.
- Penrose, E 1959, *The theory of the growth of the firm*, John Wiley and Sons, New York.
- Perdomo-Ortiz, J, González-Benito, J, & Galende, J 2009, 'An analysis of the relationship between total quality management-based human resource management practices and innovation', *The International Journal of Human Resource Management*, vol.20, no.5, pp.1191–218.
- Pickersgill, R 2005, *Dimensions of innovation: some historical perspectives on vocational education and training and innovation in Australia – a discussion paper*, NCVER, Adelaide.
- Porter, ME 1980, *Competitive strategy: techniques for analysing industries and competitors*, Free Press, New York.
- Prajogo, DI & Ahmed, PK 2006, 'Relationships between innovation stimulus, innovation capacity, and innovation performance', *R&D Management*, vol.36, no.5, pp.499–515.
- Rainbird, H 1994, 'The changing role of the training function: a test for the integration of human resource and business strategies?', *Human Resource Management Journal*, vol.5, no.1, pp.72–90.

- Roffe, I 1999, 'Innovation and creativity in organisations: a review of the implications for training and development', *Journal of European Industrial Training*, vol.23, no.4/5, pp.224–37.
- Santamaría, L, Nieto, MJ & Barge-Gil, A 2009, 'Beyond formal R&D: taking advantage of other sources of innovation in low- and medium-technology industries', *Research Policy*, vol.38, no.3, pp.507–17.
- Schabracq, MJ, Winnubst, JA & Cooper, CL 2003, *The handbook of work and health psychology*, John Wiley & Sons, Chichester.
- Schroeder, RG, Scudder, GD & Elm, DR 1989, 'Innovation in manufacturing', *Journal of Operations Management*, vol.8, no.1, pp.1–15.
- Schuler, RS & Jackson, SE 1987, 'Linking competitive strategies with human resource management practices', *The Academy of Management Executive*, vol.1, no.3, pp.207–19.
- Shipton, H, West, MA, Dawson, J, Birdi, K & Patterson, M 2006, 'human resource management as a predictor of innovation', *Human Resource Management Journal*, vol.16, no.1, pp.3–27.
- Smith, A & Hayton, G 1999, 'What drives enterprise training? Evidence from Australia', *International Journal of Human Resource Management*, vol.10, no.2, pp.251–72.
- Smith, A & Smith, E 2007, 'The role of training in the development of human resource management in Australian organisations', *Human Resource Development International*, vol.10, no.3, pp.263–79.
- Smith, A, Oczkowski, E & Selby Smith, C forthcoming, 'To have and to hold: modelling the drivers of employee turnover and skill retention in Australian organisations', *International Journal of Human Resource Management*.
- Smith, A, Oczkowski, E, Noble, C & Macklin, R 2003, 'New management practices and enterprise training in Australia', *International Journal of Manpower*, vol.24, no.1, pp.31–47.
- Smith, E, Pickersgill, R, Smith, A & Rushbrook, P 2005, *Enterprises' commitment to nationally recognised training for existing workers*, NCVER, Adelaide.
- Stiglitz, J 2010, *Freefall: free markets and the sinking of the world economy*, W.W. Norton & Co., New York.
- Storey, J 1995, *Human resource management: a critical text*, International Thomson, London.
- 2001, 'Human resource management today: an assessment', in *Human resource management: a critical text*, 2nd edn, ed. J Storey, Thompson, London, pp.3–20.
- Subramaniam, M & Youndt, MA 2005, 'The influence of intellectual capital on the types of innovative capabilities', *Academy of Management Journal*, vol.48, no.3, pp.450–63.
- Tang, HK 1998, 'An inventory of organizational innovativeness', *Technovation*, vol.19, no.1, pp.41–51.
- Terziovski, M 2007, *Building innovation capability in organizations: an international cross-case perspective*, Imperial College Press, London.
- Tether, BS, Mina, A, Consoli, D & Gagliardi, D 2005, *A literature review on skills and innovation: how does successful innovation impact on the demand for skills and how do skills drive innovation?*, CRIC report for the Department of Trade and Industry, ESRC Centre for Research on Innovation and Competition, University of Manchester.
- Tidd, J, Bessant, J & Pavitt, K 2005, *Managing innovation: integrating technological, market and organizational change*, 3rd edn, John Wiley & Sons, Chichester.
- Toner, P, Marceau, J, Hall, R & Considine, G 2004, *Innovation agents: vocational education and training skills and innovation in Australian industries and firms*, NCVER, Adelaide.
- Vinding, AL 2006, 'Absorptive capacity and innovative performance: a human capital approach', *Economics of Innovation & New Technology*, vol.15, no.4/5, pp.507–17.
- Vracking, WJ 1990, 'The innovative organization', *Long Range Planning*, vol.23, no.2, pp.94–102.
- Walton, RE 1985, *Challenges in the management of technology and labour relations*, Harvard Business School, Boston, MA.
- Wenger, EC 1998, 'Communities of practice: learning as a social system', *The Systems Thinker*, vol.9, no.5, viewed November 2009, <<http://www.open.ac.uk/ldc08/sites/www.open.ac.uk/ldc08/files/Learningasasocialsystem.pdf>>.
- Womack, JP, Jones, DT & Roos, D 1990, *The machine that changed the world*, Harper Perennial, New York.
- Zeytinoglu, IU & Cooke, GB 2009, 'On-the-job training in Canada: associations with information technology, innovation and competition', *Journal of Industrial Relations*, vol.51, no.1, pp.95–112.
- Zien, KA & Buckler, SA 1997, 'Dreams to market: crafting a culture of innovation', *Journal of Product Innovation Management*, vol.14, no.4, pp.274–87.

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