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HRM and Innovation: A Multi-level Organisational Learning Perspective

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HRM and Innovation: A Multi-level Organisational Learning Perspective

Abstract

Drawing on the 4I organisational learning framework (Crossan *et al.*, 1999), this article develops a model to explain the multi-level and cross-level relationships between HRM practices and innovation. Individual, team, and organisational level learning stocks are theorized to explain how HRM practices affect innovation at a given level. Feed-forward and feedback learning flows explain how cross-level effects of HRM practices on innovation take place. In addition, we propose that HRM practices fostering individual, team, and organisational level learning should form a coherent system to facilitate the emergence of innovation. The article is concluded with discussions on its contributions and potential future research directions.

Keywords: HRM practices, innovation, organisational learning, multi-level

INTRODUCTION

Innovation is essential for success, survival, and renewal of organisations, especially in a rapidly changing business environment (Anderson *et al.*, 2014). As innovation is a knowledge intensive activity and much knowledge is mental (Argote and Ingram, 2000; Grant, 1996), human resources are expected to impact innovation (Kang and Snell, 2009; Kang *et al.*, 2007; Hayton, 2005). Consistent with this argument, an increased number of studies have explored the relationship between human resource management (HRM) and innovation (e.g., Shipton *et al.*, 2006; Jiménez-Jiménez and Sanz-Valle, 2008; Hayton, 2005; Collins and Smith, 2006; Seeck and Diehl, in press; Sanders and Lin, 2016).

Despite progress, this stream of research is characterized by limitations. A prominent limitation is the lack of a levels perspective, because both HRM and innovation are multi-level phenomena. While previous research on multi-level HRM has elaborated on the *level of abstraction*, which is pertinent to the internal vertical fit between HRM philosophies, policies, and practices (e.g., Kepes and Delery, 2006; Arthur and Boyles, 2007), scholars note that HRM *practices* (including single or systems of HRM practices) could target individual actors or group of actors and affect outcomes at different *levels of analysis* (Kepes and Delery, 2007). Several authors have examined HRM practices at different levels of analysis in recent years (e.g., Jiang *et al.*, 2013; Wright and Nishii, 2007). Innovation is also a multi-level construct because it occurs at individual, team, and organisational levels and even higher industry and geographic region levels (Gupta *et al.*, 2007; Drazin *et al.*, 1999). Nevertheless, limited research establishes the link between HRM practices at one level and performance at another level (Kepes and Delery, 2007). This observation applies squarely to HRM-innovation research. Reviewing existing studies reveals that single-level research dominates the field and research at different levels of analysis is guided by divergent theories and frameworks (Lin, 2015). To illustrate, research on *individual* creativity and innovation

has typically drawn on psychological theories to examine employee knowledge, skills, and motivation as the antecedents of innovation (e.g., Chang *et al.*, 2014; Binyamin and Carmeli, 2010; Liu *et al.*, in press); whereas research on *organisational* innovation comes from an intellectual capital (e.g., Wang and Chen, 2013) or knowledge management perspective (Chen and Huang, 2009). The disparate literature leaves researchers with a rather fragmented picture (see also Sanders and Lin, 2016).

Another limitation associated with the lack of a levels perspective is that it constrains researchers' capacity to understand the multi-level and cross-level effects involved in the relationship between HRM and innovation. Do HRM practices that stimulate innovation at one level necessarily induce innovation at another level? How do HRM practices fostering individual innovation ultimately impact organisational innovation? How do HRM practices aiming to enhance organisational and team level innovation influence individual innovation? Answering these questions entails more theoretical elaborations on the intervening processes.

To address these limitations, the first aim of this study is to bridge the research at different levels of analysis by utilizing an organisational learning framework. Learning refers to the gain of knowledge from past experiences (Argote, 2012). It is accompanied by change in cognition and behaviour, which is the driver of innovation (Vera *et al.*, 2011). Scholarship has extensively evidenced that learning is central to innovation (e.g., Shipton *et al.*, 2005; Montes *et al.*, 2005), whether learning from within a community (Brown and Duguid, 1991) or from outside of an organisation (e.g., Cohen and Levinthal, 1990). Although learning is beneficial for performance in general (Argote, 2012), the knowledge-intensive nature of innovation means that learning holds a particularly prominent position in innovation. Stata (1989) contends that organisational learning is the principal process by which innovation occurs.

Although multiple streams exist within the organisational learning literature (Easterby-Smith *et al.*, 2000), one framework that is inherently multi-level and therefore speaks to the aims of this article is the 4I framework (Crossan *et al.*, 1999). The 4I framework proposes that organisational learning occurs at multiple levels: individual, team (or group), and organisation. Learning within a given level accumulates learning *stocks* (Vera and Crossan, 2004). Learning across levels is linked by social and psychological processes: intuiting, interpreting, integrating, and institutionalising (the 4I's). While the intuiting-institutionalising link represents *feed-forward* (i.e., bottom-up) *learning flow*, the institutionalising-intuiting link involves *feedback* (i.e., top-down) *learning flow*. The 4I framework is developed to address a central issue in strategic renewal – the tension between exploration and exploitation. Crossan *et al.* (1999) contend that feed-forward learning is related to organisational exploration and feedback learning is associated with organisational exploitation. Because exploration captures discovery and innovation and exploitation includes refinement and efficiency (March, 1991), this framework is pertinent to the outcome of interest in this article – innovation. In fact, the 4I framework has been used to explain phenomena related to innovation, such as entrepreneurial opportunities (Dutta and Crossan, 2005). Moreover, the 4I framework takes a process orientation approach (Crossan *et al.*, 2011), which makes it appropriate for explaining the *mechanisms* involved in the HRM-innovation relationship.

In this article, we propose that HRM practices contribute to innovation through accumulating learning stocks at each of the individual, team, and organisational levels and aligning learning stocks with learning flows across levels. On the one hand, we specify the HRM practices that influence the learning stocks at each level; on the other hand, we propose that HRM practices at different levels should form a coherent system to align learning stocks

with flows to facilitate the emergence of innovation. We also propose a guiding principle to bundle HRM practices across levels.

We provide several contributions to the literature. First, we apply the 4I organisational learning framework to the study of the HRM-innovation relationship. This framework offers a multi-level perspective that enables us to explain the multi-level and cross-level effects involved in this relationship. Second, this study identifies single or bundles of HRM practices that affect the 4I processes at the individual, team, and organisational levels. The guiding principle we propose to bundle HRM practices across levels sheds new light on the internal fit of HRM practices. It also offers practical implications for the design and implementation of HRM practices. Last, we clarify the nature of the emergence of innovation and organisational learning through a multi-level lens.

This article is organized as follows. First, following the recommendations on developing multi-level theories (Chen *et al.*, 2005; Kozlowski and Klein, 2000), we clarify the constructs of innovation, HRM practices, and organisational learning. For emergent constructs, we also specify the nature of their emergence (i.e., whether they are composition or compilation processes, Kozlowski & Klein, 2000). Then, drawing on the 4I framework and existing research, we pursue to build a multi-level model to integrate the literature and explain the relationships between HRM practices and innovation. Finally, we discuss the implications of our model and suggest avenues for future research.

CONSTRUCT CLARIFICATION AND THEORETICAL BACKGROUND

Innovation at Multiple Levels

Innovation has various definitions. At the core of each definition is the concept of ‘newness’ (Gupta *et al.*, 2007). Different from routine performance, which is based on the exploitation of knowledge and emphasizes quality and efficiency criteria, innovation entails

exploratory action and creative thinking (Bledow *et al.*, 2009). Innovation requires people to open their mind to new ideas and discover new ways acting. Following West and Farr (1990: 9), we define innovation as ‘the intentional introduction and application within a role, group, or organisation, of ideas, processes, products, or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, the organisation, or wider society’. This definition acknowledges that innovation occurs at multiple levels and can be manifested in various forms.

Team and organisational innovation have their foundations in individual creative ideas and behaviours (Sanders and Lin, 2016). Through interactions, exchanges of ideas, and synthesis of conflicting demands (Bledow *et al.*, 2009), higher level innovation *emerges*. A phenomenon is defined as emergent when it originates in the cognition, affect, or behaviours of individuals, but is amplified by their interactions. The two types of emergence are composition and compilation (Kozlowski and Klein, 2000). In the *composition* model, which is based on the assumption of isomorphism, it is critical that within-unit observations are sufficiently similar so that they converge in a linear fashion to give rise to a higher-level property. Collective phenomena that emerge through composition processes are described as ‘shared properties’. In contrast, the *compilation* model is based on the assumption of discontinuity. Lower-level properties differ from each other and form a pattern or array to yield a higher-level property. Collective phenomena that emerge through compilation processes are described as ‘configural properties’.

Innovation, which is defined in a similar fashion as exploration in our analysis, is a variation-increasing process (March, 1991). Innovation encourages divergent thinking to generate many possible solutions instead of arriving at one best solution (De Dreu and West, 2001). It entails differential contributions from individuals and teams to increase the variation. Fleck (1979) compares collective innovation to a soccer match or orchestra. In an

orchestra, musicians play different instruments and contribute to the performance. It is the flawless combination of these different instruments that makes a perfect symphony. In a similar fashion, higher level innovation is not a simple addition of lower level innovations. It involves complex coordination and integration of the latter. Empirical research finds that different departments within a company have different ‘thought worlds’ and approach innovation from different perspectives (Dougherty, 1992). Their contributions are grounded in their functional backgrounds, which is a result of labour division (Daft, 1978; Dougherty, 1992). Successful innovators are those that are able to overcome the departmental barriers and synthesize their expertise. At the individual level, variance has been observed among scientists in their patenting activities in American and Japanese semiconductor companies (Narin and Breitzman, 1995) and in German chemical, mechanical, and electronic companies (Ernst et al., 2000). The unequal distribution of human capital explains this phenomenon. Given the variation-increasing nature of innovation and based on the empirical evidence above, we argue that the emergence of innovation is primarily a compilation process where lower level entities make differential contributions.

The compilational emergence of innovation means organisations need to utilize management practices to coordinate and integrate the different ‘parts’ to enable the emergence of the ‘whole’. The integration strategies a team or organisation adopts may influence the compilation type. At one extreme, after assessing all the independently proposed new ideas, the team or organisation could select the most radical idea. This represents the ‘maximum emergence’ model (Kozlowski and Klein, 2000: 71). In this case, minimum interactions may be required. At another extreme, the team or organisation may see its members’ different perspectives offering space for a new framework to develop. In this ‘creative synthesis’, the team or organisation focuses its collective attention and enacts ideas by building on similarities within diverse perspectives (Harvey, 2014). This represents a

‘patterned emergence’ model, which includes configurations capturing networks and linkages (Kozlowski and Klein, 2000: 73), as members have to interact, possibly quite intensively, to identify and build on each other’s assumptions.

HRM Practices at Multiple Levels

Scholars refer to different levels of abstraction in HRM research. Some commonly identified levels range from HRM philosophies over HRM policies to HRM practices (Arthur and Boyles, 2007; Kepes and Delery, 2006). HRM philosophies refer to the guiding principles that characterize the value and treatment of employees; HRM policies identify goals and guidelines for specific HRM practices; and HRM practices refer to the broad tools and techniques used to achieve HRM goals. Examples of HRM practices include recruiting practices, pay for performance, job rotation, and use of training. In this article, we focus on HRM practices, because it is through HRM practices that HRM policies become established (Kepes and Delery, 2007). This level of abstraction is also the most researched (Combs *et al.*, 2006). Further, HRM practices could be examined individually or in bundles. A bundle of HRM practices are often referred to as an HRM system, such as high performance work system (Huselid, 1995). In this article, we use ‘HRM practices’ to refer to single or systems (bundles) of practices.

Researchers have investigated which HRM practices fit with a specific organisational strategy and how different categories of HRM practices fit with each other to produce synergies (Schuler and Jackson, 1987; Combs *et al.*, 2006). Much less attention is given to the fit of HRM practices across levels of analysis (Kepes and Delery, 2007). For example, the study of Schuler and Jackson (1987) identifies HRM practices to promote desired role behaviours to support different business strategies, but they did not disentangle the effects of HRM practices at different levels of analysis and how they fit with each other.

In recent years, research on the multi-level and cross-level effects of HRM practices has gained momentum (Jiang *et al.*, 2013; Shipton *et al.*, 2016; Klein and Kozlowski, 2000). This situation has arisen for various reasons. First, most organisational performance goals are established in a top-down manner (DeNisi, 2000). Because an important role of HRM practices is to support organisational performance goals (Bae and Lawler, 2000; Schuler and Jackson, 1987), most HRM practices are also set in a top-down manner. Researchers suggest that prerequisite HRM practices to support goals at the individual, team, and organisational levels differ. For example, Phillips and Gully (2015) argue that recruitment practices at the organisational level should attend to employer branding and resource allocation; at the team level, they should focus on fit and conveying team message, whereas at the individual level they involve individual interviews and specific messages. Moreover, researchers argue that the mechanisms to explain the effects of HRM practices also vary across levels of analysis (Buller and McEvoy, 2012; Jiang *et al.*, 2013). Although researchers acknowledge that the alignment between HRM practices across levels determines organisational effectiveness (Phillips and Gully, 2015; Buller and McEvoy, 2012), little is known about what the multi-level and cross-level relationships mean for forming this alignment. In this article, we attempt to address this issue.

Learning at Multiple Levels

The 4I framework proposes that four related processes – intuiting, interpreting, integrating, and institutionalising – underpin organisational learning (Crossan *et al.*, 1999). *Intuiting* captures the ‘preconscious recognition of the pattern and/or possibilities inherent in a personal stream experiences’ (Weick, 1995: 25). *Interpreting* is the process of explaining an idea to oneself and/or to others. *Integrating* refers to developing shared understanding and meaning among individuals or groups and taking coordinated action through mutual adjustment. *Institutionalising* is the process of ensuring that routinized actions take place.

Learning at the individual level captures intuiting and interpreting; At the team level, it involves both interpreting and integrating, but integrating is central (Bontis *et al.*, 2002); At the organisational level, learning includes both integrating and institutionalising. However, it is institutionalising that sets organisational learning apart from individual and team learning (Crossan *et al.*, 1999). The learning processes occurring at each level contribute to the learning stocks within that level. The flow of learning stocks across levels is represented in the feed-forward and feedback learning processes (Vera and Crossan, 2004; Bontis *et al.*, 2002). The 4I framework is illustrated in Figure 1.

-----‘Figure 1 around here’-----

In feed-forward learning, team and organisational learning originate from individual intuiting and interpreting. Common team understanding is attained through interactions among individuals and through integrating individuals’ knowledge. Organisational learning occurs when individual and team knowledge is embedded in the organisational structures, databases, routines, and culture (Crossan *et al.*, 1999). Feed-forward learning, therefore, is an emergent process. This process, we argue, involves both compilation and composition. On one hand, due to the heterogeneous background and experiences of individuals, their intuitions and interpretations of a phenomenon are mostly likely to differ. The interactions among individuals and teams also follow a complex, often nonlinear pattern. The emergence of organisational learning, therefore, involves mostly compilation processes (Crossan *et al.*, 2011). On the other hand, individuals sometimes have similar learnings due to their shared experiences. For example, transactive memory is a collective awareness of who knows what (Wegner, 1987), which a study found to positively affect team creativity (Gino *et al.*, 2010). Consensus is an important component of transactive memory (Austin, 2003). Common knowledge of who knows what within the team enables the members to identify the location

of knowledge and combine it to create new knowledge. Through working together for a long time, all team members gain this knowledge, which becomes a ‘shared property’ of the team.

In feedback learning, institutionalised knowledge assumes a posterior permanence and forms the context where individual and team learning occurs (Morgeson and Hofmann, 1999; Crossan *et al.*, 1999). Institutions regulate and constrain the intuiting and interpreting of individuals and set the decision rules for team integration. For example, organisational culture contains implicit or explicit rules about ‘the way things are done here’. It serves as a behavioural control mechanism, instilling norms and values (Schneider, 1988).

TOWARDS A MULTI-LEVEL MODEL OF THE HRM-INNOVATION RELATIONSHIP

In this section, we explicate the multi-level relationships between HRM practices and innovation. Specifically, we first theorize the influences of HRM practices on the learning stocks and innovation at the individual, team, and organisational levels and map relevant empirical evidence against the 4I framework. To appropriately capture the literature, we searched the electronic databases ABI-Inform and Web of Science. For HRM, the search terms used were *human resource(s)*, *HR*, *HRM*, *personnel*, *human capital*, *high performance work practices*, *reward*, *compensation*, *performance appraisal*, *performance evaluation*, and *training*. For innovation, the search terms were *innovation*, *innovative*, and *creativity*. Forty empirical studies were identified, including both qualitative and quantitative studies. Nevertheless, the current analysis is not intended to be a literature review. Therefore, the literature included in this article is not comprehensive¹. Then, we shed light on the implications of cross-level organisational learning flows for innovation and for the alignment of HRM practices. The model we propose is shown in Figure 2.

-----‘Figure 2 around here’-----

Individual Level

Individual level learning captures the processes of intuiting and interpreting. Intuiting includes recognizing past patterns (expert intuition) and discerning new possibilities (entrepreneurial intuition). It is the latter that is more related to innovation, as individuals with entrepreneurial insights are able to make novel connections that have not been identified previously (Crossan *et al.*, 1999). Through further articulating the ideas to oneself and others (i.e., interpreting), entrepreneurial intuitions are taken one step forward and begin to crystallize into cognitive maps (Huff, 1990). People with rich and complex cognitive maps are able to see perspectives and act in ways that others cannot (Crossan *et al.*, 1999). Bontis *et al.* (2002) propose that these cognitive maps, which represent individual knowledge and competence, can be thought of as individual level learning stocks. They further propose that for interpreting, knowledge and competence are not sufficient. Motivation and direction for interpreting are also critical. In total, individual competence and motivation to undertake required tasks represent individual level learning stocks.

Individual competence for entrepreneurial interpreting can be built through HRM practices that focus more on skill-based development than job or function-based development (Kang and Snell, 2009). The former develops generalists, whereas the latter develops specialists. Kang and Snell (2009) note that generalists are better at exploratory learning than specialists. Generalists are less confined to a particular perspective, since they are by definition positioned in multiple knowledge domains, whereas specialists have a reduced willingness and ability to utilize knowledge outside of their own domain, incurred by a ‘functional bias’ (Dougherty, 1992). Skill-based HRM practices include broad and multi-dimensional job designs, job rotations, and recruitment/selection based on potential and so forth (Kang and Snell, 2009). Empirical evidence has provided support for the effectiveness of some of the HRM practices in promoting innovation. For example, job complexity

(Hackman and Oldham, 1980) has been consistently identified as a key factor driving creativity at the individual level, because it allows individuals to use a variety of skills (Shalley *et al.*, 2009; Jiang *et al.*, 2012a). Job rotation and training for multiple domains expose employees to new knowledge, broaden their skills repertoire, and foster their innovation (Chang *et al.*, 2014; Liu *et al.*, in press).

Regarding HRM practices fostering motivation for innovation, compensation has received much research attention. Although research findings on performance-based pay have historically been inconsistent (Hayton, 2005), recent research shows that it might be the compensation structure that matters. In a laboratory setting, Ederer and Manso (2013) find that purely performance-based pay discourages participants from exploratory behaviours, because exploration is inherently uncertain and spending more time on it could incur uncertain pay. Instead, a mix of fixed and performance-based pay is more effective, because fixed pay buffers the uncertainty while performance-based pay provides motivation for exploration. Another crucial motivation factor researchers have repeatedly emphasized in the innovation literature is autonomy, from which intrinsic motivation derives (Mumford and Hunter, 2005). Autonomy in one's job induces autonomous motivation and positively affects individuals' creative thinking (Liu *et al.*, 2011).

Premised on the above evidence and arguments, we propose:

Proposition 1: Individual level learning stocks (employee competence and motivation) mediate the relationship between HRM practices and innovation at the individual level.

Team Level

Team level learning captures the processes of collective interpreting as well as integrating individuals' knowledge to achieve a common understanding (Bontis *et al.*, 2002). Collective engagement in interpreting provides multiple perspectives and generates enriched interpretations that are necessary input for innovation (De Dreu and West, 2001; Crossan *et*

al., 1999). Shared understanding that results from integrating individual knowledge further paves the way for taking coordinated actions to implement innovation. For both team interpreting and integrating, dialogues and conversations are pivotal (Crossan *et al.*, 1999). In dialogue, people explore issues from multiple perspectives. Through continuing and active conversations, shared understanding and solutions to conflicts develop. Such team dynamics and integration represent team level learning stocks (Bontis *et al.*, 2002).

A requisite for generating enriched interpretations within a team is that individual team members have diverse knowledge to contribute. Lack of diversified knowledge could be detrimental for innovation. Two studies have observed that failing to select heterogeneous team members impede the success of innovation projects (Bondarouk and Looise, 2005; Zanko *et al.*, 2008). Hence, recruitment and selection based on *complementary* fit of team members is critical for team level learning and innovation.

An HRM practice such as teamwork creates opportunities for people to meet and converse. Teamwork is a collaborative process through which the members of a team work together to achieve a common goal. The task and goal interdependence make conversations among team members an imperative rather than a choice. Teamwork has been viewed as a major mechanism for knowledge integration (Grant, 1996). Structurally, it decentralizes authority within a team and establishes lateral ties. Cognitively, teamwork develops common language and shared mental models, which facilitates coordination and integration (Mohammed and Dumville, 2001). Affectively, trust developed through repeated interactions promotes knowledge sharing and transfer (Edmondson, 1999). Further HRM practices, such as team-based training and team-based compensation, improve teams' capacity and motivation for integration. Training intact teams and training employees for teamwork skills allow team members to identify skill-integration problems and learn the requirements of other team members (Kleinman & Serfaty, 1989). Rewarding team performance alleviates

problems incurred by individual performance based pay: Because individuals tend to over-evaluate their ability, social comparison often leads to perceptions of inequity (Larkin *et al.*, 2012). Such perceptions undermine trust in peers and hinders knowledge transfer and integration (Lin, 2007). Team-based compensation succeeds when integration is pivotal and benefits when integration outweighs the costs of free riding (Larkin *et al.*, 2012), which is mostly the case with team innovation.

Although research at the team level is scant (Lin, 2015), empirical research finds that teamwork, team-based training and compensation, combined with other HR practices, may effectively enhance team integration and coordination and improve team innovation (Chi *et al.*, 2009; Chiang *et al.*, 2014). Team compensation based on tangible performance also reinforces the effect of a strategic innovation vision and increases team innovation (Camelo-Ordaz *et al.*, 2008). Hence, we propose:

Proposition 2: Team level learning stocks (team dynamics and integration) mediate the relationship between HRM practices and innovation at the team level.

Organisational Level

While some researchers view organisation as a collection of individuals and treat organisational level learning as large-scale shared understanding, Crossan *et al.* (1999) suggest that organisational learning should represent the translation of shared understanding into organisational knowledge repositories, such as culture, rules and procedures, systems, and routines (Walsh and Ungson, 1991). After all, it is the knowledge stored in these repositories, which is referred to as organisational memory (Huber, 1991), that endures after individuals leave the organisation and teams are restructured (Argote, 2012; Crossan *et al.*, 1999). This institutionalising process is the distinct feature of organisational level learning. Organisational memory that ensues from the institutionalising process represents organisational level learning stocks (Bontis *et al.*, 2002). It is noteworthy that organisational

level learning must be defined in the context of strategic orientation, since the ultimate purpose of organisational learning is to support organisation strategy (Crossan *et al.*, 1999; Bontis *et al.*, 2002). Based on the literature, we identify two types of organisational level learning stocks that are critical to innovation – innovation supportive culture and dynamic capabilities².

Organisational culture has received much attention in HRM research due to the crucial role of HRM in shaping organisational culture (Hayton, 2005). Culture determines ‘the way things are done here’. It guides organisational resource allocation, forms collective mindset and affects individual behaviours. Although it is not yet conclusive what an ‘innovation supportive’ culture includes, some common elements identified in the literature are: encouragement of risk-taking, freedom and autonomy, facilitation of collaboration, and provision of resources and support (see the reviews of McLean, 2005; Hayton, 2005).

Given that culture permeates every aspect of organisational life, the building of organisational culture is less likely the result of a single HRM practice. A systems approach has been adopted by most researchers when studying organisational culture. Collins and Smith (2006) focus on commitment-based HRM practices that foster a climate of trust, cooperation, and shared language and ultimately positively affect the revenues from new products and services. Selvarajan *et al.* (2007) argue that an empowerment-oriented HRM system that includes reward sharing, competencies development, feedback taking, and information sharing induces an entrepreneurial culture, and contributes to organisational innovation. Lau and Ngo (2004) associate an HRM system including a focus on training, performance-based reward, and team development with a culture that has a developmental and innovation orientation. Although current research is inconclusive about what practices an innovation-supporting HRM system contains, it is argued that the key is that various HRM

practices communicate a strong message to organisational members that innovation is expected and encouraged (Sanders *et al.*, 2014; Ostroff and Bowen, 2016).

Dynamic capabilities refer to the capabilities of configuring and reconfiguring resources and operational routines to address changing environment (Teece *et al.*, 1997). Teece (2011: 4) explicitly links dynamic capabilities to innovation and claims that ‘enterprises with strong dynamic capabilities are intensely entrepreneurial. They not only adapt to business ecosystems, but also shape them through innovation’. The development of dynamic capacities first and foremost involves senior management who play a substantive role in making strategic investment decisions and allocating resources between the old and the new businesses (O'Reilly III and Tushman, 2008; Teece, 2007). Because established organisational processes and routines tend to be risk averse and favour efficiency over innovation, it is suggested that compensations for the senior management must be designed to create neutrality when evaluating investment in the old and new capabilities (Teece, 2007). Two studies on CEO compensation support the idea that aligning CEO compensation with long-term organisational interests is positively related to firm innovation (Sheikh, 2012; Tien and Chen, 2012).

Dynamic capabilities also derive from developing a human capital pool that is flexible regarding resource availability and coordination (Wright and Snell, 1998). Chang *et al.* (2013) identify two flexibility-oriented HRM systems: resource-flexibility-oriented HRM (RFHRM) and coordination-flexibility-oriented HRM (CFHRM). Both HRM systems contribute to developing one type of dynamic capability – absorptive capacity – and promote organisational innovation. RFHRM includes extensive training, job rotation, and broadly designed jobs to develop employees’ diverse skills. Although these practices sound similar to those we have identified at the individual level, the level of consideration is the whole organisation, rather than the individuals. It is expected that employees’ skills could be used

for alternative purposes so that collectively, flexibility will emerge at the organisational level. CFHRM includes HRM practices such as recording information about employees, sharing important information with them, and using organisation-based and group-based pay. Similarly, the purpose is to enable efficient coordination and redeployment of human resources at the organisational level.

Taken together, HRM practices at the organisational level promote innovation mainly through institutionalising an innovation supportive culture and orchestrating human resources to build dynamic capabilities. Different from individual and team level learning, this process takes much longer (Crossan *et al.*, 1999) and entails a more holistic view of the organisation. However, once this process takes place, it endures longer and ensures that innovation is not a spontaneous, but a consistent organisational action.

Proposition 3: Organisational level learning stocks (innovation supportive culture and dynamic capabilities) mediate the relationship between HRM practices and innovation at the organisational level.

Cross Levels

In the foregoing sections, we have elaborated on the effects of HRM practices on learning processes and stocks in the sequence of the individual to organisational level, which illustrates the process of feed-forward learning. We chose to follow this sequence because learning at higher levels builds on learning at lower levels. For example, team and organisational level learning has no knowledge to draw on without individual level learning, since most knowledge is embedded in individuals' heads (Argote and Ingram, 2000). Nevertheless, learning at a lower level does not guarantee its translation into learning at a higher level. Indeed, conceiving of learning as containing dynamic flows means that these cross-level flows can be blocked and that bottlenecks could arise in the learning flows (Crossan *et al.*, 1999). This particularly applies to feed-forward learning flow given the

difficulty of exerting upward influences by lower level entities (Hitt *et al.*, 2007). To facilitate the feed-forward learning and prevent knowledge from stockpiling at a lower level, we suggest that HRM practices fostering learning at a lower level must be complemented with those fostering learning at higher levels. That means, when an organisation has utilized HRM practices to develop individuals' competence and motivation in innovation (e.g., through individual training, job rotation, and well-structured compensation etc.), HRM practices targeted at integrating team members (e.g., teamwork, team-based training, and compensation etc.) and orchestrating organisational resources (e.g., using organisational wide information sharing and organisation-based pay to encourage cross-departmental collaboration) must be present for cross-level learning and innovation to emerge.

Organisational learning also contains a feedback learning flow where institutions exert downward influences on team and individual learning (Crossan *et al.*, 1999). Compared with upward influences, downward influences are argued to be more straightforward. Classic institutional theorists assert that structure forcefully shapes individual actions and decision making such that they become increasingly isomorphic over time (e.g., Granovetter, 1985). The isomorphism ensures that validated knowledge is exploited. However, it drives out idiosyncratic intuiting and diminishes variation needed for innovation. Hence, tension is experienced between feed-forward and feedback learning (Crossan *et al.*, 1999), which is manifested in the tension between exploration and exploitation and between risky innovation and proven success (March, 1991; Benner and Tushman, 2003).

In practice, the influences of feedback learning tends to overweigh that of feed-forward learning (O'Reilly III and Tushman, 2008), To counteract the negative influences of feedback learning upon innovation and allow individual intuitions to surface, institutions must be destroyed and renewed from time to time. This resonates with Schumpeter (1942) who coined the term 'creative destruction' to refer to innovation. Indeed, organisations can rely on

validated past knowledge for some time, but not forever if they want to avoid the ‘success trap’, which is where organisations rely on previously successful exploitation at the expense of exploration (March, 1991). We have borne this in mind when identifying innovation supportive culture and dynamic capabilities as two organisational level learning stocks critical to innovation. An innovation supportive culture encourages changes to existing institutions. Dynamic capabilities ensure that sufficient resources are allocated towards new business areas and new capabilities (O’Reilly III and Tushman, 2008). These two types of learning stocks are inherently self-renewing. They instil a sense of self-reflection in organisational members. HRM systems supporting these learning stocks, therefore, exert downward influences on team and individual innovation by creating an environment where individuals could challenge existing institutional parameters and initiate changes (Shipton *et al.*, in press). They also ensure that incentives and resources are provided to new initiatives.

The tension between feed-forward and feedback learning, however, cannot be fully resolved. One illustration is that autonomy granted to individuals fosters individual innovation, but may hamper team integration (Argote, 2012; Mumford and Hunter, 2005). Since both individual innovation and team integration are essential for team innovation to emerge, trade-offs have to be made. This has implications for the bundling of HRM practices across levels. We propose that an important factor that influences where the trade-off lies is the task interdependence between individuals and teams. As task interdependence increases, more coordination and integration efforts are needed for higher level innovation to emerge (Wright and Nishii, 2007). More HRM practices fostering team and organisational level learning, hence, need to be utilized. Take pay as an example, the proportion of team-performance-based pay and organisation-based pay needs to be increased (versus individual-performance based pay) when the innovation task entails collaboration within and across teams. Therefore, we propose:

Proposition 4a: HRM practices at different levels need to form a coherent system to facilitate cross-level learning and the emergence of innovation.

Proposition 4b: As task interdependence increases, team level and organisational level HRM practices become more important for the emergence of innovation.

DISCUSSIONS AND FUTURE RESEARCH DIRECTIONS

Applying the 4I organisational learning framework, which is multi-level in nature (Crossan *et al.*, 1999; Crossan *et al.*, 2011), our analysis explicates the multi-level and cross-level relationships between HRM practices and innovation. This article makes several contributions. First, the multi-level perspective adds to the literature by providing more clarity on the mechanisms operating at each level and cross levels. The conception of organisational learning as containing both learning stocks and learning flows provides insights into these mechanisms. In particular, the dynamic view of learning as flows sheds light on how cross-level effects of HRM practices on innovation take place, which adds to the extant literature.

Second, we have identified HRM practices that are instrumental in accumulating learning stocks at each level of analysis and suggested a guiding principle to bundle them in order to align learning stocks with flows. Thereby, we contribute to the discussions on the fit within an HRM system (Kepes and Delery, 2007; Jiang *et al.*, 2012b). Further, this carries important practical implications for the design and implementation of HRM. It allows for efficient investment in HRM practices, provided that learning problems have been identified at a certain level. It also provides guidance for bundling HRM practices given the task interdependence feature. The contingency view renders flexibility to practitioners for them to manage innovation projects, because the interdependence between tasks and members in innovation projects may vary from case to case.

Third, conceptualizing individual competence and motivation, team dynamics and integration, and innovation supportive culture and dynamic capabilities as individual, team, and organisational level learning stocks critical to innovation, the model we propose has potential to unify previous research within a single organisational learning framework. The mechanisms found in previous research operating at different levels can possibly be linked to learning stocks at these levels. This has the potential to render a parsimonious model (Dublin, 1978; Whetten, 1989).

This study also informs several important future research directions. First, the propositions in this model serve as the starting point for empirical testing. Identifying the manifestation of learning stocks at different levels addresses the difficulty of measuring a slippery learning construct (Easterby-Smith *et al.*, 2000). It allows learning to be assessed in both quantitative and qualitative studies. Future studies could rely on surveys, interpretive narratives or observations to empirically test the propositions.

Second, we show that as the level of innovation moves up, HRM practices do not only need to harness individual level competence and motivation, but also need to manage more complex team integration and organisational institutionalisation. We also argue that HRM practices required to foster learning at different levels are likely to differ, although sometimes they overlap. Future research can empirically test whether some HRM practices are better stimulators of innovation at one level than another. Similar ideas have been tested in climate research. For example, Bain *et al.* (2001) related individual and team innovation with a climate measure of participative safety, support for innovation, objectives and task orientation. They find that participative safety and support are particularly important for team innovation, whereas objectives and task orientation are particularly relevant for individual innovation. Similar differential effects can be expected for HRM practices.

Third, we have suggested that given the tension between feed-forward and feedback learning, trade-offs are necessary. The contingent factors that determine the location of the trade-off lines are worthwhile exploring. Although we have identified task interdependence as one critical factor, external environment might also come into play. Research has suggested that in a high velocity environment, more autonomy to individuals and teams is needed to take advantage of their speedy responses; whereas in a low velocity environment, integration and coordination is more important (Puranam *et al.*, 2006). In these two circumstances, the bundles of HRM practices will likely appear different.

CONCLUSION

The objective of this article is to develop a multi-level model to explain the relationship between HRM practices and innovation. Drawing on the 4I organisational learning framework, we propose that individual, team, and organisational level learning stocks explain how HRM practices contribute to innovation at these levels. Feed-forward and feedback learning flows explain the cross-level effects of HRM practices on innovation. How to bundle HRM practices across levels to foster alignment between learning stocks and flows and address tensions between feed-forward and feedback learning are discussed. Our analysis adds a multi-level perspective to the literature in line with the 4I organisational learning framework. It also points to several important future research directions.

REFERENCES

- Anderson, N., Potočnik, K. and Zhou, J. (2014). 'Innovation and creativity in organisations: A state-of-the-science review, prospective commentary, and guiding framework', *Journal of Management*, 40: 5, 1297-1333.
- Argote, L. (2012). *Organisational Learning: Creating, Retaining and Transferring Knowledge*, Springer: New York.
- Argote, L. and Ingram, P. (2000). 'Knowledge transfer: A basis for competitive advantage in firms', *Organisational Behaviour and Human Decision Processes*, 82: 1, 150-169.
- Arthur, J. B. and Boyles, T. (2007). 'Validating the human resource system structure: A levels-based strategic HRM approach', *Human Resource Management Review*, 17: 1, 77-92.
- Austin, J. R. (2003). 'Transactive memory in organisational groups: the effects of content, consensus, specialization, and accuracy on group performance', *Journal of Applied Psychology*, 88: 5, 866-878.
- Bae, J. and Lawler, J. J. (2000). 'Organisational and HRM strategies in Korea: Impact on firm performance in an emerging economy', *Academy of Management Journal*, 43: 3, 502-517.
- Bain, P. G., Mann, L. and Pirola-Merlo, A. (2001). 'The innovation imperative: The relationships between team climate, innovation, and performance in research and development teams', *Small Group Research*, 32: 1, 55-73.
- Benner, M. J. and Tushman, M. L. (2003). 'Exploitation, exploration, and process management: The productivity dilemma revisited', *Academy of Management Review*, 28: 2, 238-256.

- Binyamin, G. and Carmeli, A. (2010). 'Does structuring of human resource management processes enhance employee creativity? The mediating role of psychological availability', *Human Resource Management*, 49: 6, 999-1024.
- Bledow, R., Frese, M., Anderson, N., Erez, M. and Farr, J. (2009). 'A dialectic perspective on innovation: Conflicting demands, multiple pathways, and ambidexterity', *Industrial and Organisational Psychology*, 2: 3, 305-337.
- Bondarouk, T. and Looise, J. K. (2005). 'HR contribution to IT innovation implementation: Results of three case studies', *Creativity and Innovation Management*, 14: 2, 160-168.
- Bontis, N., Crossan, M. M. and Hulland, J. (2002). 'Managing an organisational learning system by aligning stocks and flows', *Journal of Management Studies*, 39: 4, 437-469.
- Brown, J. S. and Duguid, P. (1991). 'Organisational learning and communities-of-practice: Toward a unified view of working, learning, and innovation', *Organisation Science*, 2: 1, 40-57.
- Buller, P. F. and McEvoy, G. M. (2012). 'Strategy, human resource management and performance: Sharpening line of sight', *Human Resource Management Review*, 22: 1, 43-56.
- Camelo-Ordaz, C., Fernández-Alles, M. d. I. L. and Valle-Cabrera, R. (2008). 'Top management team's vision and human resources management practices in innovative Spanish companies', *International Journal of Human Resource Management*, 19: 4, 620-638.
- Chang, S., Gong, Y., Way, S. A. and Jia, L. (2013). 'Flexibility-oriented HRM systems, absorptive capacity, and market responsiveness and firm innovativeness', *Journal of Management*, 39: 7, 1924-1951.

- Chang, S., Jia, L., Takeuchi, R. and Cai, Y. (2014). 'Do high-commitment work systems affect creativity? A multilevel combinational approach to employee creativity', *Journal of Applied Psychology*, 99: 4, 665-680.
- Chen, C.-J. and Huang, J.-W. (2009). 'Strategic human resource practices and innovation performance - The mediating role of knowledge management capacity', *Journal of Business Research*, 62: 1, 104-114.
- Chen, G., Bliese, P. D. and Mathieu, J. E. (2005). 'Conceptual framework and statistical procedures for delineating and testing multilevel theories of homology', *Organisational Research Methods*, 8: 4, 375-409.
- Chi, N.-W., Huang, Y.-M. and Lin, S.-C. (2009). 'A double-edged sword? Exploring the curvilinear relationship between organisational tenure diversity and team innovation: The moderating role of team-oriented HR practices', *Group & Organisation Management*, 34: 6, 698-726.
- Chiang, Y.-H., Shih, H.-A. and Hsu, C.-C. (2014). 'High commitment work system, transactive memory system, and new product performance', *Journal of Business Research*, 67: 4, 631-640.
- Cohen, W. M. and Levinthal, D. A. (1990). 'Absorptive capacity: A new perspective on learning and innovation', *Administrative Science Quarterly*, 35: 1, 128-152.
- Collins, C. J. and Smith, K. G. (2006). 'Knowledge exchange and combination: The role of human resource practices in the performance of high-technology firms', *Academy of Management Journal*, 49: 3, 544-560.
- Combs, J., Liu, Y., Hall, A. and Ketchen, D. (2006). 'How much do high-performance work practices matter? A meta-analysis of their effects on organisational performance', *Personnel Psychology*, 59: 3, 501-528.

- Crossan, M. M., Lane, H. W. and White, R. E. (1999). 'An organisational learning framework: from intuition to institution', *Academy of Management Review*, 24: 3, 522-537.
- Crossan, M. M., Maurer, C. C. and White, R. E. (2011). 'Reflections on the 2009 AMR decade award: do we have a theory of organisational learning?', *Academy of Management Review*, 36: 3, 446-460.
- Daft, R. L. (1978). 'A dual-core model of organisational innovation', *Academy of Management Journal*, 21: 2, 193-210.
- De Dreu, C. K. and West, M. A. (2001). 'Minority dissent and team innovation: the importance of participation in decision making', *Journal of Applied Psychology*, 86: 6, 1191-1201.
- DeNisi, A. S. (2000). 'Performance appraisal and performance management: A multilevel analysis', in: K. J. Klein and S. W. J. Kozlowski (eds.), *Multilevel Theory, Research, and Methods in Organisations*. pp. 121-156. San Francisco: Jossey-Bass.
- Dougherty, D. (1992). 'Interpretive barriers to successful product innovation in large firms', *Organisation Science*, 3: 2, 179-202.
- Drazin, R., Glynn, M. A. and Kazanjian, R. K. (1999). 'Multilevel theorizing about creativity in organisations: A sensemaking perspective', *Academy of Management Review*, 24: 2, 286-307.
- Dublin, R. (1978). *Theory Development*, Free Press: New York.
- Dutta, D. K. and Crossan, M. M. (2005). 'The nature of entrepreneurial opportunities: understanding the process using the 4I organisational learning framework', *Entrepreneurship Theory and Practice*, 29: 4, 425-449.
- Easterby-Smith, M., Crossan, M. and Nicolini, D. (2000). 'Organisational learning: debates past, present and future', *Journal of Management Studies*, 37: 6, 783-796.

- Ederer, F. and Manso, G. (2013). 'Is pay for performance detrimental to innovation?', *Management Science*, 59: 7, 1496-1513.
- Edmondson, A. C. (1999). 'Psychological safety and learning behaviour in work teams', *Administrative Science Quarterly*, 44: 2, 350-383.
- Ernst, H., Leptien, C. and Vitt, J. (2000). 'Inventors are not alike: the distribution of patenting output among industrial R&D personnel', *IEEE Transactions on Engineering Management*, 47: 2, 184-199.
- Fleck, L. (1979). *Genesis and Development of a Scientific Fact*, University of Chicago Press: Chicago, IL.
- Gino, F., Argote, L., Miron-Spektor, E. and Todorova, G. (2010). 'First get your feet wet: When and why prior experience fosters team creativity', *Organisational Behaviour and Human Decision Processes*, 111: 2, 102-115.
- Granovetter, M. (1985). 'Economic action and social structure: The problem of embeddedness', *American Journal of Sociology*, 91: 3, 481-510.
- Grant, R. M. (1996). 'Toward a knowledge-based theory of the firm', *Strategic Management Journal*, 17, 109-122.
- Gupta, A. K., Tesluk, P. E. and Taylor, M. S. (2007). 'Innovation at and across multiple levels of analysis', *Organisation Science*, 18: 6, 885-897.
- Hackman, J. R. and Oldham, G. R. (1980). *Work Redesign*, Addison-Wesley: Reading, MA.
- Harvey, S. (2014). 'Creative synthesis: Exploring the process of extraordinary group creativity', *Academy of Management Review*, 39: 3, 324-343.
- Hayton, J. C. (2005). 'Promoting corporate entrepreneurship through human resource management practices: A review of empirical research', *Human Resource Management Review*, 15: 1, 21-41.

- Hitt, M. A., Beamish, P. W., Jackson, S. E. and Mathieu, J. E. (2007). 'Building theoretical and empirical bridges across levels: Multilevel research in management', *Academy of Management Journal*, 50: 6, 1385-1399.
- Huber, G. P. (1991). 'Organisational learning: The contributing processes and the literatures', *Organisation Science*, 2: 1, 88-115.
- Huff, A. S. (1990). *Mapping Strategic Thought*, John Wiley & Sons: New York.
- Huselid, M. A. (1995). 'The impact of human resource management practices on turnover, productivity, and corporate financial performance', *Academy of Management Journal*, 38: 3, 635-672.
- Jiang, J., Wang, S. and Zhao, S. (2012a). 'Does HRM facilitate employee creativity and organisational innovation? A study of Chinese firms', *International Journal of Human Resource Management*, 23: 19, 4025-4047.
- Jiang, K., Lepak, D. P., Han, K., Hong, Y., Kim, A. and Winkler, A.-L. (2012b). 'Clarifying the construct of human resource systems: Relating human resource management to employee performance', *Human Resource Management Review*, 22: 2, 73-85.
- Jiang, K., Takeuchi, R. and Lepak, D. P. (2013). 'Where do we go from here? New perspectives on the black box in strategic human resource management research', *Journal of Management Studies*, 50: 8, 1448-1480.
- Jiménez-Jiménez, D. and Sanz-Valle, R. (2008). 'Could HRM support organisational innovation?', *International Journal of Human Resource Management*, 19: 7, 1208-1221.
- Kang, S.-C. and Snell, S. A. (2009). 'Intellectual capital architectures and ambidextrous learning: a framework for human resource management', *Journal of Management Studies*, 46: 1, 65-92.

- Kang, S. C., Morris, S. S. and Snell, S. A. (2007). 'Relational archetypes, organisational learning, and value creation: Extending the human resource architecture ', *Academy of Management Review*, 32: 1, 236-256.
- Kepes, S. and Delery, J. E. (2006). 'Designing effective HRM systems: The issue of HRM strategy', in: R. J. Burke and C. L. Cooper (eds.), *The Human Resources Revolution: Why Putting People First Matters*. pp. 55-76. Amsterdam, NL: Elsevier.
- Kepes, S. and Delery, J. E. (2007). 'HRM systems and the problem of internal fit', in: P. Boxall, J. Purcell and P. Wright (eds.), *Oxford Handbook of Human Resource Management*. pp. 385-395. New York: Oxford University Press.
- Klein, K. J. and Kozlowski, S. W. J. (2000). *Multilevel Theory, Research, and Methods in Organisations*, Jossey-Bass: San Francisco.
- Kozlowski, S. W. J. and Klein, K. J. (2000). 'A multilevel approach to theory and research in organisations: Contextual, temporal, and emergent processes', in: K. J. Klein and S. W. J. Kozlowski (eds.), *Multilevel Theory, Research, and Methods in Organisations: Foundations, Extensions, and New Directions*. pp. 3-90. San Francisco, CA: Jossey-Bass.
- Larkin, I., Pierce, L. and Gino, F. (2012). 'The psychological costs of pay-for-performance: Implications for the strategic compensation of employees', *Strategic Management Journal*, 33: 10, 1194-1214.
- Lau, C. M. and Ngo, H. Y. (2004). 'The HR system, organisational culture, and product innovation', *International Business Review*, 13: 6, 685-703.
- Lin, C.-H. (2015). 'HRM and innovation: Review, synthesis and extension'. *The 75th Annual Meeting of the Academy of Management*. Vancouver, Canada.
- Lin, C.-P. (2007). 'To share or not to share: Modeling tacit knowledge sharing, its mediators and antecedents', *Journal of Business Ethics*, 70: 4, 411-428.

- Liu, D., Chen, X.-P. and Yao, X. (2011). 'From autonomy to creativity: A multilevel investigation of the mediating role of harmonious passion', *Journal of Applied Psychology*, 96: 2, 294-309.
- Liu, D., Gong, Y., Zhou, J. and Huang, J.-C. (in press). 'Human resource systems, employee creativity, and firm innovation: The moderating role of firm ownership', *Academy of Management Journal*.
- March, J. G. (1991). 'Exploration and exploitation in organisational learning', *Organisation Science*, 2: 1, 71-87.
- McLean, L. D. (2005). 'Organisational culture's influence on creativity and innovation: A review of the literature and implications for human resource development', *Advances in Developing Human Resources*, 7: 2, 226-246.
- Mohammed, S. and Dumville, B. C. (2001). 'Team mental models in a team knowledge framework: Expanding theory and measurement across disciplinary boundaries', *Journal of Organisational Behaviour*, 22: 2, 89-106.
- Montes, F. J. L., Moreno, A. R. and Morales, V. G. (2005). 'Influence of support leadership and teamwork cohesion on organisational learning, innovation and performance: An empirical examination', *Technovation*, 25: 10, 1159-1172.
- Morgeson, F. P. and Hofmann, D. A. (1999). 'The structure and function of collective constructs: Implications for multilevel research and theory development', *Academy of Management Review*, 24: 2, 249-265.
- Mumford, M. D. and Hunter, S. T. (2005). 'Innovation in organisations: A multi-level perspective on creativity', *Research in Multi-Level Issues*, 4, 11-74.
- Narin, F. and Breitzman, A. (1995). 'Inventive productivity', *Research Policy*, 24: 4, 507-519.

- O'Reilly III, C. A. and Tushman, M. L. (2008). 'Ambidexterity as a dynamic capability: Resolving the innovator's dilemma', *Research in Organisational Behaviour*, 28, 185-206.
- Ostroff, C. and Bowen, D. (2016). 'Reflections on the 2014 Decade Award: Is there strength in the construct of HR system strength?', *Academy of Management Review*, 41: 2, 196-214.
- Phillips, J. M. and Gully, S. M. (2015). 'Multilevel and strategic recruiting: Where have we been, where can we go from here?', *Journal of Management*, 41: 5, 1416-1445.
- Puranam, P., Singh, H. and Zollo, M. (2006). 'Organizing for innovation: Managing the coordination-autonomy dilemma in technology acquisitions', *Academy of Management Journal*, 49: 2, 263-280.
- Sanders, K. and Lin, C.-H. V. (2016). 'Human resource management and innovative behaviour: Considering interactive, informal learning activities', in: H. Shipton, P. Budhwar, P. Sparrow and A. Brown (eds.), *Human Resource Management, Innovation and Performance*. pp. 32-47. London: Palgrave Macmillan.
- Sanders, K., Shipton, H. and Gomes, J. F. (2014). 'Guest editors' introduction: Is the HRM process important? Past, current, and future challenges', *Human Resource Management*, 53: 4, 489-503.
- Schneider, S. C. (1988). 'National vs. corporate culture: Implications for human resource management', *Human Resource Management*, 27: 2, 231-246.
- Schuler, R. S. and Jackson, S. E. (1987). 'Linking competitive strategies with human resource management practices', *Academy of Management Executive*, 1: 3, 207-219.
- Schumpeter, J. (1942). *Capitalism, Socialism, and Democracy*, Harper & Bros: New York.
- Seeck, H. and Diehl, M.-R. (in press). 'A literature review on HRM and innovation-taking stock and future directions', *International Journal of Human Resource Management*.

- Selvarajan, T., Ramamoorthy, N., Flood, P. C., Guthrie, J. P., MacCurtain, S. and Liu, W. (2007). 'The role of human capital philosophy in promoting firm innovativeness and performance: Test of a causal model', *International Journal of Human Resource Management*, 18: 8, 1456-1470.
- Shalley, C. E., Gilson, L. L. and Blum, T. C. (2009). 'Interactive effects of growth need strength, work context, and job complexity on self-reported creative performance', *Academy of Management Journal*, 52: 3, 489-505.
- Sheikh, S. (2012). 'Do CEO compensation incentives affect firm innovation?', *Review of Accounting and Finance*, 11: 1, 4-39.
- Shipton, H., Budhwar, P., Sparrow, P. and Brown, A. (2016). *Human Resource Management, Innovation and Performance*, Palgrave MacMillan: England.
- Shipton, H., Budhwar, P., Sparrow, P. R. and Brown, A. (in press). 'HRM and innovation: looking across levels', *Human Resource Management Journal*.
- Shipton, H., Fay, D., West, M., Patterson, M. and Birdi, K. (2005). 'Managing people to promote innovation', *Creativity and Innovation Management*, 14: 2, 118-128.
- Shipton, H., West, M. A., Dawson, J., Birdi, K. and Patterson, M. (2006). 'HRM as a predictor of innovation', *Human Resource Management Journal*, 16: 1, 3-27.
- Stata, R. (1989). 'Organisational learning: The key to management innovation', *Sloan Management Review*, 30: 3, 63-74.
- Teece, D. J. (2007). 'Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance', *Strategic Management Journal*, 28: 13, 1319-1350.
- Teece, D. J. (2011). *Dynamic Capabilities and Strategic Management*, Oxford University Press: New York.

- Teece, D. J., Pisano, G. and Shuen, A. (1997). 'Dynamic capabilities and strategic management', *Strategic Management Journal*, 18: 7, 509-533.
- Tien, C. and Chen, C.-N. (2012). 'Myth or reality? Assessing the moderating role of CEO compensation on the momentum of innovation in R&D', *International Journal of Human Resource Management*, 23: 13, 2763-2784.
- Vera, D. and Crossan, M. (2004). 'Strategic leadership and organisational learning', *Academy of Management Review*, 29: 2, 222-240.
- Vera, D., Crossan, M. and Apaydin, M. (2011). 'A framework for integrating organisational learning, knowledge capabilities, and absorptive capacity', in: M. Easterby-Smith and M. A. Lyles (eds.), *Handbook of Organisational Learning and Knowledge Management* pp. 153-180. Hoboken, NJ, USA: John Wiley & Sons.
- Walsh, J. P. and Ungson, G. R. (1991). 'Organisational memory', *Academy of Management Review*, 16: 1, 57-91.
- Wang, D. and Chen, S. (2013). 'Does intellectual capital matter? High-performance work systems and bilateral innovative capabilities', *International Journal of Manpower*, 34: 8, 861-879.
- Wegner, D. M. (1987). 'Transactive memory: A contemporary analysis of the group mind', in: B. Mullen and G. R. Goethals (eds.), *Theories of Group Behaviour*. pp. 185-208. New York: Springer.
- Weick, K. E. (1995). *Sensemaking in organisations*, Sage: Thousands Oaks, CA.
- West, M. A. and Farr, J. L. (1990). 'Innovation at work', in: M. A. West and J. L. Farr (eds.), *Innovation and Creativity at Work: Psychological and Organisational Strategies*. Chichester: Wiley.
- Whetten, D. A. (1989). 'What constitutes a theoretical contribution?', *Academy of Management Review*, 14: 4, 490-495.

- Wright, P. M. and Nishii, L. H. (2007). 'Strategic HRM and organisational behaviour: Integrating multiple levels of analysis'. *CAHRS Working Paper Series*. Ithaca, NY.
- Wright, P. M. and Snell, S. A. (1998). 'Toward a unifying framework for exploring fit and flexibility in strategic human resource management', *Academy of Management Review*, 23: 4, 756-772.
- Zanko, M., Badham, R., Couchman, P. and Schubert, M. (2008). 'Innovation and HRM: Absences and politics', *International Journal of Human Resource Management*, 19: 4, 562-581.

¹ The results of the literature review could be found in Lin (2015) which was reported at the 75th Annual Meeting of the Academy of Management, Vancouver.

² In fact, established HRM practices are also institutionalised organisational level learning stocks. However, in this section, we focus on how HRM practices can affect other institutions that may affect innovation.

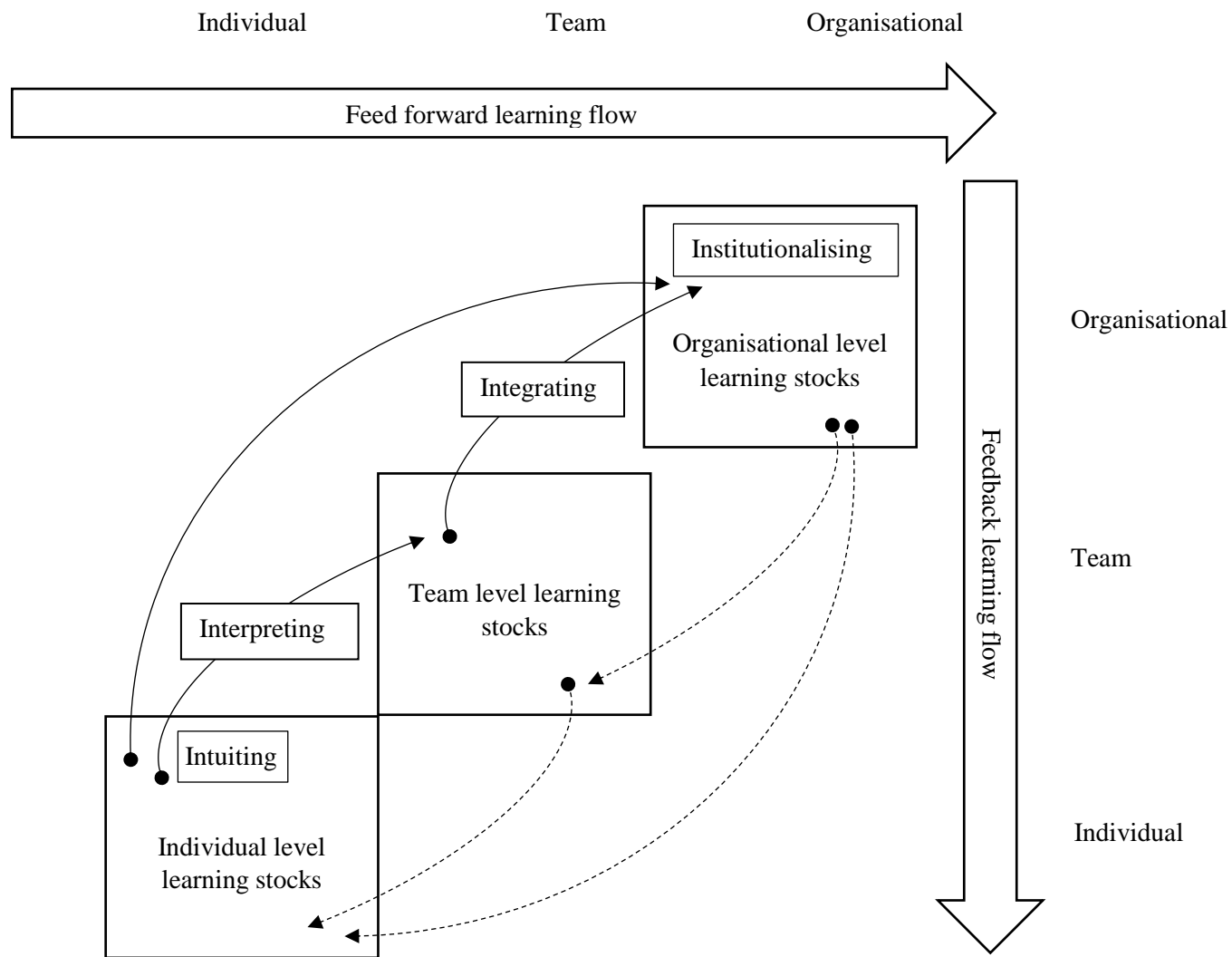


Figure 1: the 4I organisational learning framework (adapted from Crossan *et al.* (1999))

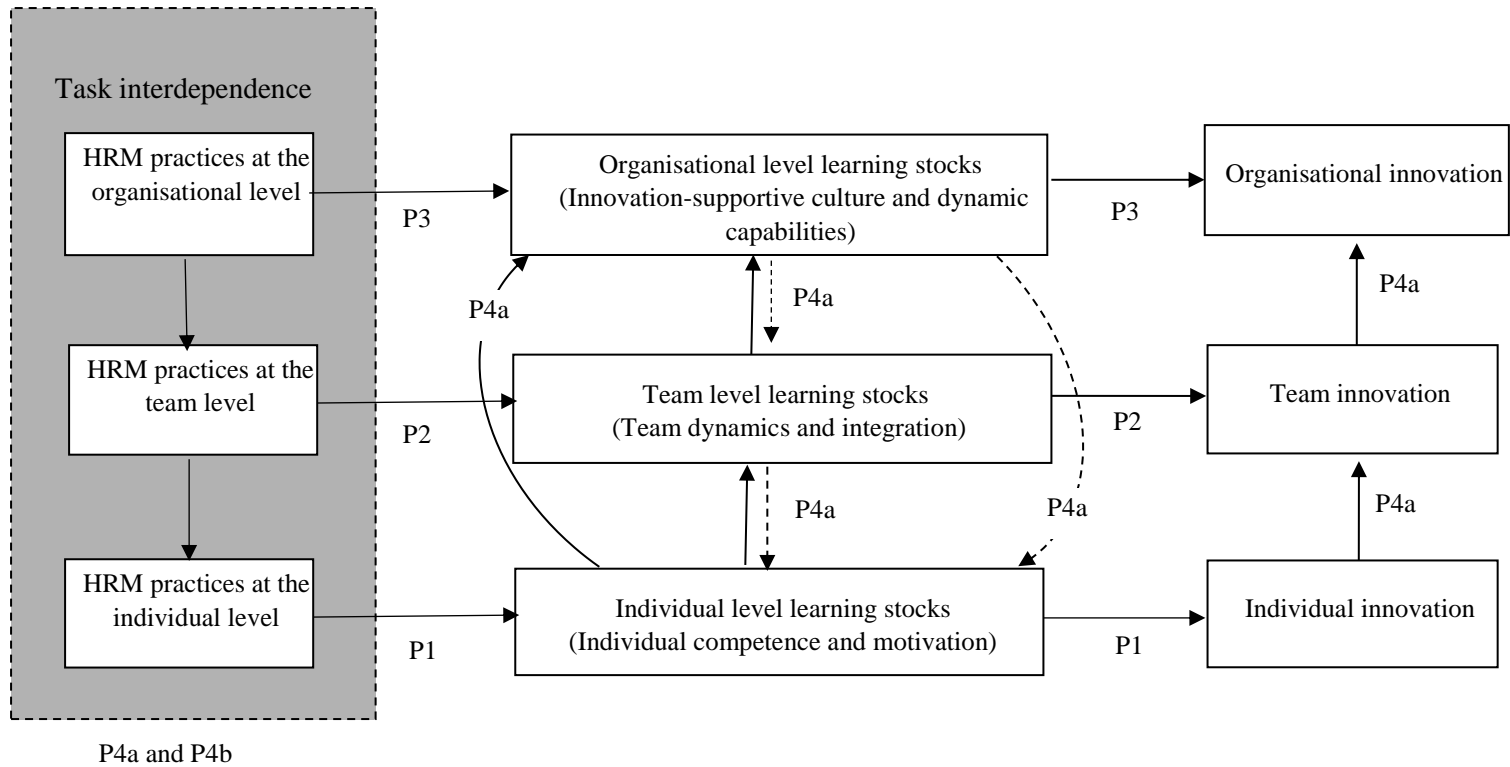


Figure 2: A multi-level model of HRM-innovation relationship.