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Enhancing Knowledge Exchange and Combination through HR practices: Reflexivity

as a translation process

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ABSTRACT

Knowledge-intensive firms (KIFs) need to encourage their employees to engage in knowledge exchange and combination (KEC) so as to create the new knowledge that is core to their success. Human resource management (HRM) has the potential to play a key role in encouraging KEC but relatively little is known about the micro-processes through which HRM and KEC are linked. Based on a sample of 498 knowledge workers in 14 KIFs in the pharmaceutical and ICT sectors in Ireland and the UK, this study focuses on the knowledge workers themselves and their perceptions of how HR practices influence KEC. In so doing, we drill down into the micro-foundations of the proposed linkages between HRM and knowledge creation, proffering reflexivity as a translation process in understanding these linkages.

INTRODUCTION

Many knowledge-intensive firms (KIFs) invest heavily in HR practices that will encourage individual learning as such investment is believed to enhance the potential for knowledge sharing and, ultimately, new knowledge for the firm (Swart and Kinnie, 2003; Swart *et al.*, 2014). However, the processes through which these HR practices encourage the knowledge exchange and combination (KEC) that is central to the creation of new knowledge remain poorly understood.

This article explores this issue from the perspective of the knowledge workers themselves by considering how their perceptions of HR practices influence how they perceive they interact with others in exchanging and combining knowledge. In so doing, we drill down into the micro-foundations (Foss *et al.*, 2010; Minbaeva *et al.*, 2012; Minbaeva, 2013) of the proposed linkages between HRM and knowledge creation, proffering reflexivity as an important process in understanding this linkage. Our explanation is rooted in both cognitive and practice-based theories of learning and knowledge (Marshall, 2008; Schön, 1983; Tsoukas, 2009; Yanow and Tsoukas, 2009) and we integrate insights from these domains in order to propose that reflexivity acts as a process that enables knowledge workers to 'translate' their individual learning into knowledge that is of value to both themselves and their organisations. By borrowing from organisation theories that have been relatively neglected by HRM scholars (Watson, 2007), we provide novel insights into how the mechanisms that govern the translation process may operate.

By focusing on reflexivity in this way, our research contributes to understanding more about the social and psychological processes (Boxall, 2014) that contribute to the "how" of HRM in the chain of processes that make models of HRM

work well or poorly' (Boxall *et al.*, 2007: 7). We identify two types of HR practices - learning-enhancing employment practices and task interdependent work practices - that, we argue, build individuals' knowledge, skills and abilities (KSAs), thereby encouraging KEC. We then extend the concept of reflexivity - a process through which individuals review, discuss and modify their work with co-workers so as to improve work effectiveness - from its primarily cognitive and team-based focus (Schippers *et al.*, 2015) to encompass individual, relational and practice elements. In so doing, we propose reflexivity as 'an explanatory mechanism located at the individual and interpersonal levels' (Minbaeva *et al.*, 2012: 389) that enables understanding of how individual learning and knowledge gained through HR practices may encourage KEC. We theorise in terms of 'the actions and interactions of individuals' on the basis that 'an understanding of the levels of individuals (*i.e.* organisational members) and their interaction may yield novel insights into organization-level phenomena' (Foss *et al.*, 2010: 457).

The paper is structured as follows. We first examine the literature on knowledge workers and the link between HRM and KEC, before considering the mediating role of reflexivity in understanding this relationship. We then present findings of a survey of 498 knowledge workers across 14 KIFs in the pharmaceutical and ICT sectors in Ireland and the UK. These workers were primarily engaged in project-based and cross-functional work, which included interdependent tasks. Finally, we discuss the implications of our research for both theory and practice.

THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

While definitions of knowledge work, knowledge workers and knowledge-intensive firms remain contested (see Alvesson, 2001), there is general agreement that knowledge workers are individuals who are highly educated, who engage in complex tasks, and who work in environments that require problem-solving and thinking skills that are used not just to apply existing knowledge but also to reconstruct and create new knowledge (Benson and Brown, 2007). A KIF represents one such environment and has been viewed as a 'firm that can produce exceptionally good results with the help of outstanding expertise' (Alvesson, 2001: 865).

The question for KIFs is how this 'outstanding expertise' might be acquired, exchanged and combined among knowledge workers. Collins and Smith (2006: 545) point out that firms in dynamic industries 'may be especially dependent on the ability of knowledge workers, such as scientists and engineers, to exchange and combine information in new ways'. 'Exchange' and 'combination' have been identified as 'generic processes' that are central to the creation of new resources, including knowledge (Moran and Ghoshal, 1996, Nahapiet and Ghoshal, 1998: 247). For Smith *et al.* (2005: 347) 'implicit in the notion of exchange is the assumption that individuals hold different levels and types of knowledge and information, and that they can/will engage in teamwork and communication to learn from one another even when payoffs are uncertain'. 'Combination' is regarded as a process of bringing together 'elements previously unconnected' or 'developing novel ways of combining elements previously associated' (Nahapiet and Ghoshal, 1998: 248).

The following conditions for knowledge exchange and combination (KEC) have been identified: the opportunity to actually make the combination or

exchange; the expectation that the exchanges or combinations will create personal and organisational value; and that individuals have the ability to engage in KEC (Moran and Ghoshal, 1996). These elements of KEC resonate with the ability, motivation and opportunity (AMO) framework utilised in literature examining the antecedents of knowledge transfer in organisations (*e.g.* Minbaeva, 2013; Minbaeva *et al.*, 2014).

Ability, Motivation and Opportunity to Engage in KEC

Prior research has identified the role of HR systems in motivating knowledge sharing among knowledge workers through 'high commitment' HR practices (Collins and Smith, 2006); 'high involvement' or 'high investment' systems (Lepak *et al.*, 2007); or 'competency-enhancing, motivation-enhancing, and opportunity-enhancing HR practices' (Chuang *et al.*, 2013: 5). These approaches typically adopt a behavioural perspective (Schuler and Jackson, 1987), which focuses on how HR practices encourage employees to behave in ways consistent with organisational goals. However, given knowledge workers' multiple, and perhaps conflicting, commitments to themselves, their professions, their clients and their teams (Alvesson, 2001; Swart *et al.*, 2014), it might instead be argued that HR systems in KIFs need to be both employee-centred and relationally-oriented if they are to encourage knowledge-sharing.

Knowledge workers are motivated to learn as such learning enhances their knowledge, skills and abilities (KSAs), thus enhancing their career opportunities. HR 'employment' practices (Boxall and Macky, 2009) might be described as 'learning-enhancing' when they expand individuals' learning and knowledge thereby

encouraging the possibility that it becomes a '*renewable* rather than an exhaustible resource' and when they 'provide the necessary depth, objectivity and creativity in understanding for new knowledge to be created' (Akbar, 2003: 2009-2016). Individuals will be motivated to engage in the exchange and combination of this new knowledge with others on the basis that it will create value for both themselves and their organisations. Evidence suggests that it is employees' perceptions of HR practices that influence their motivation, attitudes and behaviour (e.g. Kehoe and Wright, 2013). For example, studies have reported a positive relationship between perceived training intensity and knowledge sharing (Buch *et al.*, 2015; Kuvass *et al.*, 2012). This research indicates that such training increases intrinsic and prosocial motivation to share knowledge (Kuvaas *et al.*, 2012), and that structural (*i.e.* high autonomy) and relational (*i.e.* supervisor support) work features are important for knowledge sharing (Buch *et al.*, 2015). In addition, a Dutch study of teaching staff shows that perceptions of high quality performance appraisals are linked to increased levels of knowledge sharing (Bednall *et al.*, 2014). These studies suggest that when employees are provided with learning-enhancing opportunities such as training and performance appraisal, they will be more motivated to exchange and combine their knowledge. We hypothesise that:

Hypothesis 1a: Individuals' perceptions of learning-enhancing employment practices will be positively associated with KEC.

The motivation to learn and engage in knowledge sharing may also emerge from the ways in which work is designed and the interactions that take place between individuals (Foss *et al.*, 2009). There have been calls for a renewed focus on

job design and, in particular, a greater focus on relational job design where, rather than considering jobs as merely a collection of tasks, interactions with others are regarded as critically important (Grant and Parker, 2009). Task interdependence is one such form of relational job design, which 'accentuates the role of interpersonal interactions and interdependencies in work' (Grant and Parker, 2009: 323). It represents 'features of the task - such as resource allocation, role definitions and task requirements - that require multiple individuals to work together to achieve performance success' (Caruso and Woolley, 2008: 253). Knowledge workers are often required to work interdependently because the complex problems they deal with require knowledge from various sources (Benson and Brown, 2007) and task interdependence can facilitate social learning by providing on-going opportunities for work-related interactions (Vogus and Sutcliffe, 2012). Perceived task interdependence has been associated with information and expertise exchange among knowledge workers (Janz *et al.*, 1997; Jarvenpaa and Staples, 2000; Quigley *et al.*, 2007), suggesting that such interdependence nurtures openness to others' ideas. On this basis, we propose that task interdependence will represent an important structural and relational feature of work that will lead to KEC. We hypothesise that:

Hypothesis 1b: Perceived task interdependence will be positively associated with KEC.

Reflexivity

Reflexivity has been viewed as a 'dynamic interaction between reflection and action with an intention to learn and change' (Antonacopoulou, 2004: 47). This

conceptualisation draws on the work of Schön (1983: 50) who introduced the notion of 'reflection-in action' (see Yanow and Tsoukas, 2009 for a critique). Schön's cognitivist orientation underpins West's development of a measure to understand 'complex decision-making group effectiveness' (West, 1996: 558). This process has been labelled as 'group task reflexivity' which is defined as 'the extent to which group members overtly reflect upon the group's objectives, strategies and processes, and adapt them to current or anticipated endogenous or environmental circumstances' (West, 1996: 559). In describing this process as a group-level phenomenon, West is not denying that reflexivity is a property of individual group members but is instead arguing for group task reflexivity as a separate phenomenon.

However, viewing the process of reflexivity solely from a group-based and cognitive perspective may downplay the roles that both individuals and practice may play in this process. In order to provide additional perspectives on reflexivity, we draw on practice-based insights provided by organisation theorists. Practice-based theories adopt a 'more holistic constructionist position in which the various elements of thinking, doing and being, and the social, cultural, historical and material settings in which they are actively situated, are conceived in relationships of co-constitution' (Marshall, 2008: 414). Although 'borrowing' constructs from related disciplines can pose challenges, it can also constitute a valid way to develop new insights and understandings (Oswick *et al.*, 2011; Whetten *et al.*, 2009). Indeed, Boxall *et al.* (2007: 7) suggest that it is characteristic of HRM as a management discipline to 'beg, steal and borrow from more basic disciplines to build up a credible body of theory'. In line with this viewpoint, we 'borrow' from organisation theory to view reflexivity as consisting in 'the practices of accountability, observability and

referability of social action, by which is meant making the world comprehensible to oneself and to the other members of a collectivity' (Garfinkel, 1967: 9; Gherardi, 2006: 29).

While cognitive and practice-based perspectives on knowledge and learning are frequently portrayed as incommensurable, Marshall (2008: 414) suggests that 'acknowledging a cognitive dimension to knowing does not have to be incompatible with a socially situated, constructionist and processual view'. Following this line of argument, and consistent with HRM's tradition of embracing insights from various disciplines (Boxall *et al.*, 2007; Watson, 2007), we integrate cognitive and practice-based theories to view reflexivity as a multi-faceted construct.

HR practices and reflexivity

Investment by organisations in learning-enhancing employment practices is not necessarily an end in itself as it has the potential to provide knowledge workers with 'learning reinvestment' (Raelin, 2001: 19) that expands their 'solution database' thereby encouraging reflection on alternative, rather than tried and tested solutions. For example, Raelin (2001: 20) suggests that access to a mentor provides individuals with opportunities to 'pay attention to others and develop mental models or cognitive maps' before trying out 'new or altered behaviours'. Investment in employees' work-related learning has also been shown to encourage engagement in follow-up informal learning that can encompass activities such as reflexive activity (Eraut, 2004). In addition, Bednall *et al.* (2014) found that teaching staff's perceptions of high quality performance appraisals were associated with increased reflection on their daily activities, while a follow-up study (Bednall and Sanders,

2014) found that the provision of formal training increased staff participation in a range of informal learning activities, including reflection. In line with this evidence, we hypothesise that:

Hypothesis 2a: Individuals' perceptions of learning-enhancing employment practices will be positively associated with perceptions of reflexivity.

In regard to perceived task interdependence, interactions regarding task performance are likely to involve evaluations of past experiences and future action. High task interdependence requires that employees 'heedfully reflect' (Sankowska and Söderlund, 2015: 4) on their interactions with others in order to develop shared meaning (Mathieu et al., 2000). This is consistent with the literature on the collective mind, which is manifested in the 'heedful interrelating' of cognition and action (Weick and Roberts, 1993: 357), whether retrospective or prospective (Maitlis and Christianson, 2014). Evidence suggests that self-reflection helps teachers to realise how task interdependence facilitates an appreciation of co-workers' knowledge as resources that will benefit their own learning (Beverborg *et al.*, 2015). Other research among knowledge workers suggests that task interdependence (De Dreu, 2002; Gurtner *et al.*, 2007) and cooperative goals (Tjosvold *et al.*, 2004) are positively associated with reflexivity among teams. This suggests that high levels of task interdependence will encourage greater reflexivity among co-workers because knowledge workers need to interpret a variety of perspectives and revise strategies accordingly. Such reflection should lead to the reframing of cognitive representations, which will facilitate a deeper understanding of the nature of tasks undertaken, thereby increasing the likelihood that action will be taken for better

coordination and integration of knowledge in the future (Gundlach *et al.*, 2006). We therefore hypothesise that:

Hypothesis 2b: Perceived task interdependence will be positively associated with perceptions of reflexivity.

Reflexivity and KEC

To understand how reflexivity and KEC are linked, it is useful to draw on insights from social learning and constructivist theories. From the perspective of social learning theory (Bandura, 1986), individual learning is situated with and through others and is 'dependent on social actions of dialogue and reflection' (Schwandt, 2005: 180). Research within a constructivist perspective emphasises 'the importance of both social practices within which new knowledge is created and social interaction through which new knowledge emerges' (Tsoukas, 2009: 941). Dialogue and the 'management of conversations' (Nonaka and Takeuchi, 1995: 86) are considered central features of the process of knowledge creation. For example, Tsoukas (2009: 953) argues for new knowledge to be conceived of as 'the making of new distinctions' which emerges through 'productive dialogue' and which 'enables participants to take a distance from their customary and unreflective ways of understanding and acting, and reconceptualise a situation at hand through conceptual combination, expansion, and/or reframing'. Indeed, Tsoukas (2003) has argued that 'new knowledge comes about when practitioners seek to turn an unreflective practice into a reflective one through reflexive social interaction' (Tsoukas, 2009: 942). Such reflection provides the opportunity for the emergence of shared codes and language that is required for the effective exchange and

combination of knowledge (Nahapiet and Ghoshal, 1998). In line with these arguments, we hypothesise that:

Hypothesis 3: Perceived reflexivity will be positively associated with perceptions of KEC.

HR Practices, Reflexivity and KEC

We have thus far argued that HR practices have the potential to provide knowledge workers with opportunities to expand their learning and knowledge and to build their reflexive capacity. However, in line with satisfying the conditions necessary for the exchange and combination of knowledge (Moran and Ghoshal, 1996), there is a need for knowledge workers to translate their individual learning into knowledge that will create value for themselves and their organisations. The notion of 'translation' captures the task of 'creating convergences and homologies by relating things that were previously different' (Gherardi and Nicolini, 2000: 333). It may also be regarded as 'a process of learning about and translating domain-specific knowledge', which allows for the 'establishment of common meanings that become adequate for the actors involved to share and assess their knowledge' (Carlile, 2004: 560).

Knowledge workers are practitioners whose knowledge is 'acquired through active engagement in and with the practice world, not through thought alone' (Yanow and Tsoukas, 2009: 1347). This requires the development of what Carlile (2004: 562) describes as a 'common lexicon', because individual-level knowledge may be domain-specific and thus difficult to share (Swart *et al.*, 2014). We argue that reflexivity, which will be enriched by perceptions of learning-enhancing practices and

stimulated by perceived task interdependence, will provide the platform for KEC. This perspective is supported in the wider literature which suggests that social interactions will promote deeper (Lewis and Herdnon, 2011) and counterfactual (Rietzschel et al., 2009) thinking and that it is this exploitation and combination of ideas that will create new knowledge (Carmeli *et al.*, 2015). As Carmeli *et al.* (2015: 6) suggest, reflection-in-conversation will alter mindsets 'enabling new lines of sight and encouraging further exploration' which will lead to unique ideas and 'facilitate the combination of different perspectives for novel solutions'. We therefore propose that perceived reflexivity may act as a translation mechanism and hypothesise that:

Hypothesis 4: Perceived reflexivity will mediate the relationship between (a) learning-enhancing employment practices and (b) task interdependent work practices and KEC.

A summary of our research model is presented in Figure 1.

[Insert Figure 1 about here]

METHOD

Sample and procedure

The study used an on-line survey of employees within 14 firms in the pharmaceutical and ICT sectors in Ireland and the UK. These sectors are considered critically important to both Ireland and the UK in their intention to become 'knowledge economies' (Department of Education and Skills, 2005; Expert Group on Future Skills Needs, 2008). We targeted 16 firms (eight firms in each country; four from each sector) and, using randomly generated lists of firms, we approached firms one-by-

one until our target was reached. Two of the UK firms (one from each sector) agreed to interviews only, resulting in survey data from a total of 14 firms. All of the larger firms were multinationals ($n = 9$), while smaller firms were indigenous ($n = 5$). This profile was broadly representative of firms in both countries in terms of size and ownership.

In small firms all employees were surveyed, but in larger firms we focused on particular departments/units employing large numbers of knowledge workers. Invitations to complete the survey were via the HR department or senior management. Of 1616 questionnaires distributed, 667 usable responses were received (317 from the UK; 350 from Ireland), yielding a final response rate of 43 per cent. Responses ranged from 10 to 131 in each firm, and response rates between firms ranged from 19 per cent to as high as 98 per cent in some smaller firms. For each firm, we checked the profile of respondents against the organisational profiles provided by HR departments and found these to be broadly consistent.

Our focus in the present study was on knowledge workers (*i.e.* those who held at least a primary degree and were employed in technical, professional and managerial roles) and we therefore excluded 169 respondents who did not meet these criteria. Of the remaining 498 respondents, 328 were employed in the pharmaceutical sector and 170 in the ICT sector. We draw on this sample of knowledge workers on the basis that their perceptions will be comparable. This approach is supported by evidence which suggests that different task environments are institutionalised and that the work environments of individuals from different industries can be perceived in similar ways (*e.g.* Daniels *et al.*, 2002).

The overall sample consisted of 66 per cent males and 34 per cent females and the mean organisational tenure was 7.5 years. Respondents were well qualified with 20 per cent holding a PhD, 27 per cent holding a masters qualification, and the remaining 53 per cent holding a primary degree. They were working in roles such as chemists, senior scientists, engineers (pharmaceutical) and software programming and development, systems architects, engineering and technical consultants (ICT).

Measures

All items were scored on a five-point Likert scale ranging from one (strongly disagree) to five (strongly agree). A full description of each scale is presented in Appendix A.

Learning-enhancing employment practices. We developed an eight-item measure of HR practices that we describe as 'learning-enhancing'. In so doing, we adopted the widely held view that the influence of HR practices on outcomes is greatest if they are adopted as bundles of complementary practices. The items measured perceptions of training and development, performance management, participation, job rotation, and mentoring. A sample item was: 'I receive training that keeps my technical skills up-to-date'. The Cronbach's alpha for the measure was .83.

Task interdependent work practices. We used three items from Kanungo's (1982) scale to measure task interdependence. The scale contained items such as 'I depend on other people for support, services or information to do my work'. The Cronbach's alpha for the scale was .73.

Reflexivity. We adapted the nine-item measure of team reflexivity developed by Swift and West (1998) to assess the ways in which individuals perceive that they and their co-workers review, discuss and modify their work to improve work effectiveness. This was in line with our aim to capture perceptions of reflexivity among co-workers and is consistent with how these levels of analysis have been incorporated into other research (Carmeli *et al.*, 2015). Following exploratory factor analysis, two negatively worded items were dropped. The final measure contained items such as 'my co-workers and I regularly discuss whether we are working effectively'. The Cronbach's alpha for the measure was .84.

Knowledge exchange and combination. We adapted Collins and Smith's (2006) scale, which measures employees' beliefs that KEC will benefit the individual or the organisation (motivation), as well as the degree to which employees believe that they have the ability to engage in exchange and combination. It contains eight items such as 'my co-workers and I see benefits from exchanging and combining ideas with one another'. The Cronbach's alpha for the measure was .87

Control variables. As the data were collected across 14 organisations, we needed to examine the nested structure of the data. We estimated the proportion of total variance explained by organisational membership by calculating ICC(1) values for all variables (Bliese and Halverson, 1998). High ICC(1) values indicate whether there are higher-level constructs that explain the heterogeneity of these variables across organisations. Although there is no standard threshold for ICC(1) values, the

threshold of .12 (James, 1982) has been widely used (*e.g.* Park *et al.*, 2010; Takeuchi *et al.*, 2007). Using McGraw and Wong's (1996) formula, the ICC(1) values were as follows: learning-enhancing employment practices (.07), task interdependence (.04), reflexivity (.08), and KEC (.03). These values are considerably lower than James' threshold, which suggests that the nested structure of the data does not substantially influence participants' responses¹. This would suggest that a multi-level approach is not necessary and that using simple regression is both justified and more parsimonious (Aguinis *et al.*, 2013).

We therefore controlled for the following variables: gender, organisational tenure (years), country, sector, education, and firm size. Gender was coded 1 for male and 0 for female. Country was coded 1 for the UK and 0 for Ireland. Sector was coded 1 for pharmaceutical and 0 for ICT. Education was coded 1 for those with a masters degree or higher. Firm size was measured as (1) < 250 employees, (2) 50-250 employees, and (3) > 250 employees.

Analysis

Our study relied on self-report measures, which presents potential issues regarding common method variance. We carried out a Harman's one-factor test by doing a principal component factor analysis using oblique rotation. Significant common method variance is indicated if one general factor accounts for the majority of covariance in the variables (Podsakoff and Organ, 1986). As expected, four factors

¹ We controlled for organisational membership in additional analyses to check if the multilevel structure of the data influenced the results but doing this made no substantial difference to the findings. We thank one of the anonymous reviewers for making this recommendation.

emerged with eigenvalues greater than one. All items explained 61 per cent of the total variance, 30 per cent of which was explained by the first factor. Since a single factor did not emerge and one general factor did not account for most of the variance, common method bias is unlikely to be a serious concern.

To test the mediation model, we used Structural Equation Modelling (SEM) using AMOS 18.0, which was followed by a bootstrapping test (Hayes, 2009). We adopted a two-step analytical strategy (Anderson and Gerbing, 1988), where we first confirmed the measurement model using confirmatory factor analysis (CFA), and then performed SEM to estimate the fit of the model to the data.

RESULTS

Means, standard deviations, inter-correlations and reliabilities are reported in Table 1.

[Insert Table 1 about here]

Model Fit

The measurement model results (CFA) indicated a good fit to the data ($\chi^2[287] = 535.79, p < .001$; CFI = .95; SRMR = .05; RMSEA = .04). Although the chi-square test was statistically significant, this statistic is known to be sensitive to sample size and may be significant even when the differences between observed and model-implied covariance are relatively small (Kline, 2011). All other indices indicated that we could proceed to further examine the structural model.

For the structural model, the results suggest that the hypothesised model fits the data well ($\chi^2[442] = 988.14, p < .001$; CFI = .90; SRMR = .06; RMSEA = .05). Figure 2 presents the structural model with standardised path coefficients.

[Insert Figure 2 about here]

Figure 2 shows that the direct links between both types of practices and KEC are positive and significant ($\beta = .42, p < .001$ for employment practices; $\beta = .14, p < .05$ for task interdependent work practices). Therefore, hypothesis 1 is supported. It also shows that both learning-enhancing employment practices ($\beta = .47, p < .001$) and task interdependent work practices ($\beta = .13, p < .05$) are positively linked with reflexivity. Therefore, hypothesis 2 is supported. It is also indicated that the link between reflexivity and KEC is positive and significant ($\beta = .54, p < .001$). This supports hypothesis 3.

To test for mediation (hypothesis 4), we followed the four conditions outlined by Baron and Kenny (1986). The support found for hypotheses 1 to 3 met the first three conditions regarding significant relationships between the independent and dependent variables, the independent variables and the mediator, and the mediator and dependent variables. Regarding the fourth condition, the direct relationship between learning-enhancing employment practices and KEC becomes weaker, but still significant, after adding reflexivity (from $\beta = .42, p < .001$ to $\beta = .17, p < .01$), indicating partial mediation. For task interdependence, the direct link with KEC becomes non-significant after adding reflexivity (from $\beta = .14, p < .05$ to $\beta = .08, n.s.$), demonstrating full mediation.

To further test for the mediated effect, we conducted a bootstrapping test using the `MEDIATE` syntax (Hayes, 2009). As the 90 per cent confidence intervals for learning-enhancing (.129, .200) and task interdependent (.017, .069) practices do not contain zero, the mediation model is further supported. Therefore, hypothesis 4 is supported.

Finally, the inclusion of control variables in our model indicated no differences in perceptions of KEC. However, perceptions of reflexivity were lower in the ICT sector, and higher within smaller firms and among those with longer tenure.

DISCUSSION

Our aim was to provide insights into the social and psychological processes that link HRM and KEC, thus contributing to understanding more about the 'how of HRM in the chain of processes that make models of HRM work well or badly' (Boxall *et al.*, 2007: 7). Our findings first of all contribute to understanding more about how individuals' perceptions of HR practices influence KEC. The results indicate the positive influence of perceptions of learning-enhancing employment practices on perceptions of KEC among knowledge workers, thereby adding to the body of prior research linking perceptions of learning-related employment practices to knowledge sharing (Bednall *et al.*, 2014; Buch *et al.*, 2015; Kuvaas *et al.*, 2014). The results also illustrate the importance of employee-centred HR practices that focus on the enhancement of learning in supporting the HRM-knowledge linkage. Thus, learning may represent an important channel that enables individuals' personal knowledge to become a 'renewable rather than an exhaustible resource' and that the benefit-cost relationship of sharing relative to withholding knowledge is improved as a result

(Akbar, 2003: 2009). In addition, perceived task interdependence was also linked to KEC. This endorses the important role of job design in KEC (Foss *et al.*, 2009), in particular relational job design (Grant and Parker, 2009), and the learning opportunities that interdependent tasks present for knowledge workers.

Second, we contribute to understanding more about the micro-level constructs and mechanisms (Foss *et al.*, 2010; Minbaeva *et al.*, 2012; Minbaeva, 2013) involved in the proposed linkage between HRM and knowledge creation. We found that reflexivity fully mediated the relationship between perceived task interdependence and perceptions of KEC, indicating that such interdependence is linked to KEC through its influence on reflexivity. One explanation for this finding lies in the structural and contingent nature of task interdependence; individuals *need* to integrate and make sense of both their own and others' knowledge in order to create new knowledge. This is consistent with the view that perceived task interdependence provides an incentive for cooperation and collaboration (Janz *et al.*, 1997; Jarvenpaa and Staples, 2000; Quigley *et al.*, 2007). However, tensions may exist between work and employment practices (Boxall and Macky, 2009) in the case of knowledge workers who have multiple, perhaps conflicting, commitments to themselves, their professions, their clients and their teams (Alvesson, 2001; Swart *et al.*, 2014). Thus, we found that perceived reflexivity only partially mediated the link between perceptions of learning-enhancing employment practices and perceptions of KEC. This finding is in line with the notion that the salience of HR practices will differ between individuals, with a corresponding variable impact on employee outcomes (Garg and Lepak, 2013). For example, if training and development is not perceived as enhancing KSAs or if performance appraisal is not of a high quality (*e.g.*

Bednall *et al.*, 2014), then knowledge workers may not necessarily engage in the 'learning reinvestment' (Raelin, 2001) or informal learning (Eraut, 2004) that will enhance reflexivity and KEC. This resonates with the conditions for KEC outlined by Moran and Ghoshal (1996) who suggest that there must be an expectation that KEC will create personal value.

Third, at a theoretical level, we extend the ways in which reflexivity has been understood and utilised within the management literature. Prior research has taken a primarily group-based and cognitive approach to conceptualising reflexivity, identifying it as a mechanism in understanding aspects of team-level behaviour and outcomes (*e.g.* Schippers *et al.*, 2015). By borrowing from organisation theory and integrating cognitive, practice-based, relational and individual-level perceptions, we provide an expanded understanding of reflexivity. This allows us to propose that reflexivity acts as a 'translation process' (Carlile, 2004; Gherhardi and Nicolini, 2000) that enables knowledge workers, through dialogue, to establish a common understanding of their knowledge. This then enhances their ability to engage in KEC, resulting in the emergence of new knowledge. By theorising in terms of the actions and interactions of individuals, we propose that reflexivity is a useful micro-level mechanism (Foss *et al.*, 2010; Minbaeva *et al.*, 2012) in understanding more about the KEC process. This is important given the over-emphasis within the knowledge sharing literature on the macro (collective, organizational) level (Foss *et al.*, 2010).

Finally, the findings have implications at a practice level. First, they suggest that to encourage KEC among knowledge workers managers need to design opportunities for reflexivity. A simple, inexpensive measure would be to organise 'brown bag' lunch-times where individuals who have recently engaged in training

and development present an overview of the learning achieved, thereby opening up opportunities for reflection and learning amongst their peers. The establishment of communities of practice within specialist areas and the redesign of work to increase task interdependence can also provide additional opportunities for reflexivity. Second, the findings suggest that extensive investment in HR systems is not necessarily crucial for the encouragement of KEC. Many organisations are not in a position to introduce sophisticated systems of HR practices as these may be expensive, or simply not feasible, particularly in smaller organisations. However, the types of learning-enhancing employment practices that were identified as important in our study are within the scope of many organisations and can be implemented through existing manager-employee relationships. In addition, they may lead to improved skill utilisation among knowledge workers by both enhancing KSAs directly and by encouraging engagement in the informal learning and 'learning reinvestment' (Raelin, 2001) that fosters reflection on alternative solutions.

Limitations and future research

A number of limitations to the research should be noted, which present potential avenues for future research. First, while we tested our model among knowledge workers from a variety of organisations that extended to two countries and two sectors, future research should consider whether our results are replicable across other types of knowledge workers and in other international contexts. Second, the research was cross-sectional, so there is the possibility that relationships detected reflect shared response bias or common method variance. While our analysis suggests that this is not a serious concern, we cannot draw firm conclusions in the

absence of longitudinal data. Third, our unit of analysis is at the level of the knowledge worker and their perceptions of KEC and so we do not provide direct and more objective evidence of the outcomes of KEC. Future research might consider these relationships at a higher level of analysis (i.e. teams, units) and incorporate more objective data as well as exploring other outcomes, such as whether KEC leads to increased levels of innovative behaviour or creativity. Finally, other variables might potentially explain the links between HR practices, reflexivity and KEC. For example, perceptions of alternative bundles of HR practices (*e.g.* more individual versus relational orientations) may strengthen or counteract both levels of reflexivity and KEC. Future research should also consider whether other features of relational job design, such as prosocial impact (Grant and Parker, 2009), moderate the relationships examined in our model. In addition, other features of the work climate (*e.g.* team trust) may mediate the relationship between HR practices and KEC.

Conclusion

By borrowing from organisation studies in order to provide additional insights into the nature and role of reflexivity, our findings contribute to understanding more about the micro-level constructs and mechanisms involved in the linkage between HRM and knowledge creation within knowledge-intensive firms.

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APPENDIX A: MEASURES

Learning-enhancing employment practices (alpha = .83)

1. I receive training that keeps my technical skills up-to-date.
2. I am encouraged to enhance my skills through on-going training and development in a broad range of areas.
3. I am rotated around various positions so that I can learn a broad range of skills.
4. My performance appraisal focuses on developing my skills and abilities.
5. My performance is assessed based on a set of clearly defined competencies.
6. I have opportunities to participate in decisions that affect my job.
7. Suggestions that I make are taken seriously.
8. I have opportunities to meet with a mentor who provides support and advice.

Task-interdependent work practices (perceived task interdependence) (alpha = .73)

1. My job cannot be done unless other sections do their work.
2. I depend on other people for support, services or information to do my work.
3. My job depends on the work of many different people for its completion.

Reflexivity (alpha = .84)

1. My co-workers and I often review our objectives.
2. The methods used by my co-workers and I to get the job done are often discussed.
3. My co-workers and I regularly discuss whether we are working effectively.
4. My co-workers and I often review whether we are getting the job done.

5. My co-workers and I often modify our objectives in the light of changing circumstances.
6. We often discuss how well we communicate information.
7. My co-workers and I are often prepared to challenge organisational practices and policies.
8. The way in which we make decisions is rarely altered. (Excluded)
9. Our work strategies are rarely changed. (Excluded)

KEC (alpha = .87)

1. My co-workers and I see benefits from exchanging and combining ideas with one another.
2. My co-workers and I believe that by exchanging and combining ideas we can move new projects or initiatives forward more quickly than by working alone.
3. My co-workers and I are good at combining and exchanging ideas to solve problems or create opportunities.
4. My co-workers and I are poor at sharing our individual ideas to come up with new ideas, products, or services. (Reverse coded)
5. My co-workers and I are capable of sharing our expertise to bring new projects or initiatives into effect.
6. It is rare for us to exchange and combine ideas to find solutions to problems. (Reverse coded)
7. My co-workers and I regularly feel that we have personally grown and developed from exchanging and combining ideas.
8. I am willing to exchange and combine ideas with my co-workers.

FIGURE 1 *Conceptual Theoretical Framework*

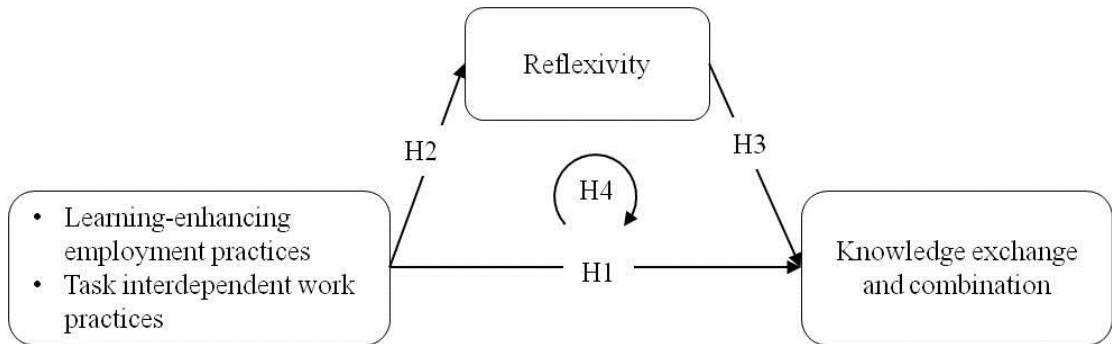


TABLE 1

Descriptive statistics and bivariate correlations

	M	SD	1	2	3	4	5	6	7	8	9
1. KEC	3.96	.51	(.87)								
2. Reflexivity	3.40	.66	.55**	(.84)							
3. Learning-enhancing employment practices	3.24	.67	.39**	.43**	(.83)						
4. Task Interdependence	3.91	.71	.17**	.20**	.16**	(.73)					
5. Gender ^a	.66	.48	.01	.03	-.07	.03					
6. Tenure	7.64	7.11	-.08	-.05	-.12*	-.01	.17**				
7. Country	.51	.50	-.01	-.02	-.19**	-.09*	.14**	.05			
8. Sector ^b	.67	.47	.04	.06	.08	.09*	-.30**	.23**	-.25**		
9. Education	.47	.50	.05	.06	.01	-.01	.02	-.09*	.17**	.12**	
10. Firm size ^c	2.67	.60	.03	-.10*	.04	.05	-.09	.27**	-.04	.59**	.19**

Note: N = 488 (Listwise). Figures in parentheses are Cronbach's alphas.

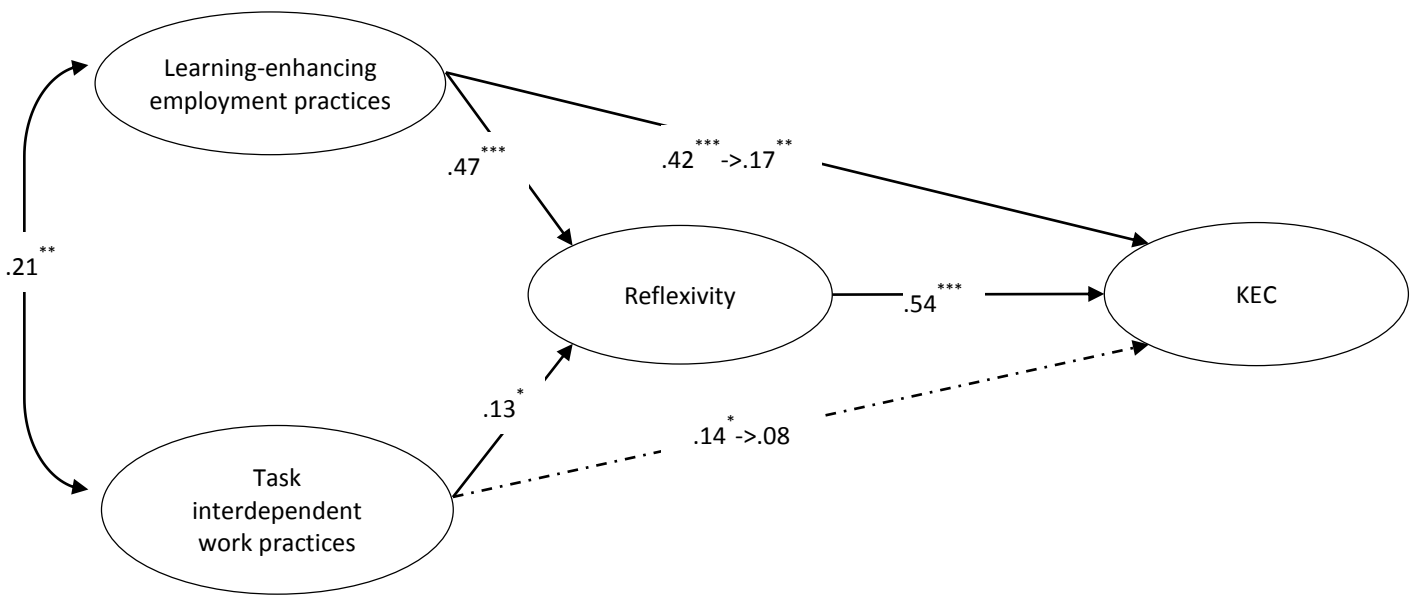
^a Gender: 1 = male, 0 = female

^b Sector: 1 = Pharmaceutical, 0 = ICT

^c Firm size: 1 = small (< 50), 2 = medium (50-250), 3 = large (> 250)

* $p < .05$; ** $p < .10$.

FIGURE 2 Structural equation modelling results



Overall Model Fit
$\chi^2/df = 988.14/442 = 2.24, p < .001, CFI = .90, SRMR = .06, RMSEA = .05.$

Controls	Reflexivity	KEC
Gender	.06	.03
Country	-.01	-.05
Sector	.10*	.04
Education	.07	-.01
Tenure	.23***	-.04
Firm size	-.26***	.10

Note: N = 447 (listwise). Standardized coefficients are reported. * $p < .05$, ** $p < .01$, *** $p < .001$.