

**Preserving prerequisites for innovation: Employee-related knowledge protection and organizational trust**

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## **Preserving prerequisites for innovation:**

### **Employee-related knowledge protection and organizational trust**

#### **1 Introduction**

Despite the increasing relevance of various forms of collaboration and the inherent need to exchange existing knowledge to create new innovation, knowledge sharing cannot be totally uncontrolled or absolutely open. In particular, those knowledge assets that are preconditions of future innovativeness and subsequent success must be handled with care (see Olander *et al.*, 2009). However, current research provides limited guidance on how to do this.

Prior research has recorded various formal and informal ways of promoting knowledge protection for innovation appropriability and value capture (e.g., Cohen *et al.*, 2000; James *et al.*, 2013, who discuss a variety of mechanisms from patents to secrecy). However, these mechanisms are mostly intended to protect innovative output (foreground knowledge). This is where we can identify the first research gap for this study: if at all, existing studies address the protection of prerequisites for future innovation (i.e. background knowledge<sup>1</sup> allowing innovation to take place) rarely and indirectly.

While prerequisites can, in principle, take different forms, they are often tightly connected to organizations' human resources, which eventually possess, utilize, combine, and generate knowledge and innovations (Bhatt, 2001). Therefore, the protection of prerequisites for innovation

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<sup>1</sup> Bhatt (2001) uses 'background knowledge' interchangeably with 'tacit knowledge' and 'foreground' interchangeably with 'explicit'. On the other hand, Bogers' (2011) distinction refers, first, to existing, and, second, to produced knowledge. Though we borrow ideas from both researchers, we follow Bogers (2011) rather than Bhatt (2001) regarding the use of terms. By our definition, background knowledge can be either tacit or explicit existing and growing asset, often related to the accumulated capabilities of employees. As such, it can be a basis for future innovation and value creation. Accumulated knowledge can form a competitive advantage and attract collaborative partners for innovation.

can be considered from this angle, as well. Baughn *et al.* (1997, p. 112) noted that “Control over human resources is a primary means for protecting intellectual capital,” and Bulgurcu *et al.* (2010, p. 523) state that there is an “emerging stream on the human perspective of information security”. In fact, two main types of risks—knowledge leaking and knowledge leaving—need to be managed in order to secure the prerequisites of innovation (Bulgurcu *et al.*, 2010; Olander and Hurmelinna-Laukkanen, 2014). Of these, knowledge leaking refers to employees unintentionally or intentionally giving out information intended to remain confidential, and knowledge leaving refers to an outbound knowledge flow resulting from employees leaving the firm.

Against this setting, it could be expected that specific human resource (HR)-related mechanisms—that is, those formalized and soft mechanisms employed by the organization that aim to affect employee behaviors and, thus, decrease employee-related knowledge risks—would effectively address both leaking and leaving. However, firms seem to find such mechanisms weak, especially compared to others (e.g., Hurmelinna-Laukkanen and Puumalainen, 2007). This may be—referring to the first research gap mentioned above—because earlier studies have taken a reactive approach to protection, reflecting HR mechanisms against innovation output rather than innovation input (see Hall *et al.*, 2012). However, there may be also other explaining factors.

First (and showing another research gap), innovation generation activity is typically seen as an activity in which background knowledge should be shared, rather than protected. In line with this, the mainstream human resource-related discourse tends to emphasize knowledge sharing. While a vast number of knowledge management and human resource management (HRM)-related studies address the issue of removing obstacles to knowledge sharing (e.g., Cabrera and Cabrera, 2005; Chen and Huang, 2009; Currie and Kerrin, 2003; Liu and Liu, 2011), little attention has been paid to employees as not only the generators of knowledge, but also its protectors (Hannah and Robertson, 2015; Liebeskind, 1997). Therefore, the relationship between seeking protection for prerequisites of innovation and HR-related mechanisms may be as visible as it could have been.

A second issue is that contextual aspects are not necessarily adequately acknowledged. Prerequisites of innovation reside, and HR-related mechanisms are employed, in the context of the firm. We therefore draw from the research according to which organizational efficiency is possible only when interdependent actors work together effectively in a positive climate of trust (Shih *et al.*, 2012; Zeffane and Connell, 2003). Various studies suggest that trust—particularly, organizational trust, which refers to employees’ feelings of confidence in and support for their employers (Blomqvist, 1997; Gilbert and Tang, 1998)—is of importance. However (pointing towards the third research gap), prior research on the role of trust with regard to knowledge protection is minimal, and existing studies have primarily addressed the roles of trust and formal control for protection in alliances, rather than in intra-organizational settings (see Biljsma-Frankema and Costa, 2005; Weibel, 2007).

Combining the above observations with the indications in prior research suggesting that motivations and context might be related to the strength of protection built on human resources and their management, we aim to answer the research question: *How does the motivation to protect prerequisites of innovation relate to the HR-related mechanisms reducing knowledge leaking and leaving, and what is the role of organizational trust in this?*

In the following sections, we first discuss HR from the point of view of protection, which we then connect to a discussion on organizational trust. We introduce the reasoning underpinning the predicted relationships and formulate hypotheses based on theoretical considerations. Finally, we report the results and concluding remarks.

## **2. Theoretical background**

Companies engaged in R&D aim to create new knowledge, innovations, or problem solutions, typically using existing knowledge gathered from a variety of sources. Thus, while knowledge

sharing is essential to both internal and external communication, concerns related to issues like the ownership of intellectual property and the transfer of intellectual capital are still present (Heiman and Nickerson, 2004; Hurmelinna-Laukkanen, 2012).

Two primary types of events can be identified in which outbound knowledge flows occur, thereby giving rise to problems. First, knowledge leakages may occur, in which, though knowledge stays within the firm and remains available for its use, it also becomes available to others (Teece, 1998). If knowledge is used outside the firm, the firm's competitive advantage may be eroded. Even if imitation does not materialize, the firm may lose the element of surprise and face obstacles in commercializing its creations (e.g., there may be knowledge that can only be productized and capitalized as long as it remains secret; or, leaked knowledge could be distorted by someone with the intent to harm the firm's reputation) (see Chang *et al.*, 2008).

Second, knowledge leaving similarly exposes the firm to possibility of others taking advantage of outflowing knowledge (McEvily and Chakravarthy, 2002), but may also mean that the knowledge is utterly lost to and can no longer be used by the originating firm (Alvesson, 2000; Darr *et al.*, 1995; Haesli and Boxall, 2005). This is the case when the only people possessing certain innovation-related expertise leave. The options available to handle the related challenges and associated boundary issues are discussed below, with a particular emphasis on the protection of background knowledge.

### *2.1 From protecting innovation to protecting future innovation prerequisites*

There are many protective mechanisms available for a firm to restrict knowledge leaking and leaving—and, if knowledge has spread beyond a firm's boundaries, to prevent or limit the imitation of the firm's core knowledge assets and innovations (Hurmelinna-Laukkanen, 2012). Overall, these mechanisms range from formal (statutory) mechanisms, such as patents and other intellectual

property rights (IPRs), to informal (non-statutory, or more firm- or product-specific) mechanisms, such as tacitness, lead time, and HR practices (Appleyard, 1996; Gallié and Legros, 2012; James *et al.*, 2013; Liebeskind, 1997; Neuhäusler, 2012). These mechanisms can support value-creation endeavors by allowing a firm to communicate about its intangible resources, and they may improve value-capturing opportunities that, in turn, can incentivize further innovation. These mechanisms can be used (based on the exclusivity and controllability related to protective power) for different purposes that make it possible for firms to benefit from innovation (e.g., by licensing, preventing others from producing and offering similar products and services in the market, ensuring freedom of operation without fear of litigation, improving image and reputation, entering international markets, etc.) (Cohen *et al.*, 2000; Hurmelinna-Laukkanen and Puumalainen, 2007). In fact, the purpose for which different mechanisms are used may determine the extent to which different mechanisms are needed. Protecting innovation output and input may generate quite different needs regarding the protective strength.

In their qualitative study on SMEs' use of protective mechanisms, Olander *et al.* (2009) found that small firms, in particular, tend to need protection in order to preserve the prerequisites of innovation, rather than to safeguard the innovative output. A later quantitative study by Olander *et al.* (2014) found evidence suggesting that it is also important for larger firms to protect such prerequisites for innovation. Sometimes, it is best not to divulge ideas publicly, but instead to concentrate on preserving prerequisites. Since the ability to continuously develop new ideas using existing innovation and knowledge assets is extremely important (Ahuja *et al.*, 2013), we concentrate our efforts on extending the knowledge of how to protect these prerequisites of innovation.

## 2.2. *The role of human resources in background knowledge protection*

Regarding the background knowledge used to generate innovation, firms might hesitate to use IPRs and other forms of protection that reveal their inventions and can indicate to competitors the directions favoured by the business. Such activity could prompt unwanted competitor attention (Langinier, 2005; Pénin, 2005; Somaya, 2003). In addition, prerequisites for innovativeness are often essentially tacit (Bhatt, 2001), including the knowledge embodied in key R&D personnel and their networks. This means that the leaking and leaving of knowledge typically originate from employees' (un)intentional actions (Olander, 2011). The spreading of firm-specific knowledge outside the firm as a result of negligence, mistakes, or intentional actions threatens the firm's ability to use that knowledge to achieve competitive advantage, especially if the knowledge is not otherwise protected (Liebeskind, 1997; Norman, 2001). Similarly, knowledge and skills can very easily depart a company through voluntary turnover, including job changes and retirement, or involuntary turnover, including dismissals and redundancy<sup>2</sup>. Therefore, it could be expected that mechanisms allowing the management of employees' behaviours for protective purposes would be relevant.

Accordingly, this study examines the various mechanisms that relate to HR without favouring formal or informal mechanisms. IPRs cannot generally prevent employees from leaving or giving out information, even if they do create obstacles to imitation. On the other hand, labour legislation or HR practices, for example, more directly affect employee behaviours in terms of handling knowledge. Norms of labour legislation, such as the obligation for employees to handle their employers' trade secrets with care, provide employers with some necessary tools. Likewise, the practice of retaining experts by decreasing staff turnover has recently attracted attention in the R&D management (Chang *et al.*, 2008; Hofer-Alfeis, 2008) and HRM (Bambacas and Kulik, 2013; Koster *et al.*, 2011) literatures. Furthermore, improving employee awareness of the importance of

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<sup>2</sup> For simplicity, we exclude the latter from the scope of this study and its empirical examination, although many aspects would apply to both types of knowledge-leaving situations.

knowledge protection through personnel training has been found relevant (Ritala *et al.*, 2015). In addition to labour legislation and HR practices, contracts also affect employee conduct, as do means of practical knowledge concealment (e.g., using passwords and restricting access to certain premises). In order to distinguish the current research from studies that cover all formal and informal mechanisms, while still allowing the inclusion of elements from both established categories, we suggest that HR-related mechanisms can be either ‘formalized’ (i.e., official or institution- or rule-based) or ‘soft’ (i.e., practical)<sup>3</sup> in nature. These mechanisms may also exhibit, to different extents, forcing (i.e., coercive and controlling) and more voluntary (i.e., self-regulative) features across boundaries. Finally, the different mechanisms may address knowledge leaking and leaving risks, irrespective of any specific classification (see Bulgurcu *et al.*, 2010). However, the characteristics of formalized and soft mechanisms may have some influence in this sense, as will be discussed in the following sections.

### **3 Hypotheses development**

#### *3.1. Addressing knowledge-leaving and knowledge-leaking risks*

The different HR-related protective mechanisms may match knowledge-leaking and knowledge-leaving risks to different degrees. For example, practical concealment, secrecy, and provisions in labour legislation can be closely related to the prevention of unwanted knowledge leakage, whereas increased commitment (see Fiorito *et al.*, 2007; Mowday *et al.*, 1979, 1982) can reduce knowledge leaving. In this study, we add to the existing knowledge by empirically examining whether knowledge leaving and leaking are conceptually distinct constructs and whether different HR-related mechanisms should be used to offer protection suited to each type of risk. In other words,

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<sup>3</sup> The former includes non-disclosure agreements (NDAs), legal loyalty obligations, and employers’ legal right to assign tasks. The latter type includes educating employees on intellectual property and secrecy issues, limiting knowledge sharing to just a few people, and using access restrictions and passwords.

we divide HR-related protection mechanisms into those targeting leaving risks and those targeting leaking risks.

First, in the case of *knowledge leaving*, it is quite clear that not all voluntary leaving can be prevented; however, the risks posed by staff changing jobs can be reduced through the implementation of appropriate HR-related mechanisms that discourage excessive mobility (Boxall, 1998). We argue that the HR-related mechanisms available to reduce this kind of risk are typically relatively soft. Although formalized mechanisms, such as non-competition contracts and long-term employment contracts with sanctions for breaches or premature terminations, can be used and, in principle, constrain knowledge leaving, their effect on keeping knowledge within the firm is somewhat limited. For example, non-competition contracts can only be used under certain circumstances (e.g., in relation to an employee's tasks and roles and their relation to the firm's trade secrets). Furthermore, an employee has the right to use the knowledge and skills gained in his profession in his future positions; thus, in this sense, the sanctions against breach of confidentiality can only be applied to employer trade secrets and not to all knowledge acquired during employment<sup>4</sup>. Many formalized mechanisms also impede forms of communication that are both desirable and necessary, since employees may refrain from sharing any knowledge due to a fear of sanctions (Liebeskind, 1996). Finally, personnel remaining in a firm against their will might even harm its innovation processes.

Therefore, we believe that it is possible to prevent knowledge leaving by using mechanisms that aim to enhance employees' commitment to the company through, for example, (im)material incentives or that aim to minimize turnover by creating a good working atmosphere. Such steps to reduce knowledge leaving will benefit the company's innovativeness, since they achieve their goal

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<sup>4</sup> The rules related to employers' abilities to restrict knowledge flows using employee-related mechanisms vary according to the legislation in question. In this research, we refer to the Finnish jurisdiction, which recognizes employees' right to practice their profession and limits the restrictions that can be set by employers to certain limited instances.

in a productive, non-coercive way. It follows that the more emphasis is placed on conserving knowledge within the firm, the more focus there will be on strengthening those (soft) mechanisms that help to reduce knowledge leaving (on a voluntary basis). In line with this, we hypothesize:

*Hypothesis 1: The motivation for protecting the prerequisites of innovation is positively related to the HR-related protection mechanisms that reduce knowledge leaving.*

As a second route for outbound knowledge flows, *knowledge leaking* occurs, for example, when employees accidentally share too much company-critical knowledge in collaborative situations (Norman, 2001). Company-critical knowledge may also be intentionally revealed by R&D workers who develop strong alliances with their collaboration partners (Husted and Michailova, 2010) or by employees seeking personal benefits (e.g., expert status) or who are frustrated with practices within their own companies (Husted *et al.*, 2013). We argue that both formalized and soft HR-related mechanisms have the potential to mitigate these risks. The enforcement of non-disclosure agreements (NDAs), for example, signals an employer's intent to keep certain knowledge secret and reminds employees of their obligations (Hannah, 2005). Some of these mechanisms are designed for situations in which confidential knowledge is made available to employees who are meant to guide the use of such knowledge, whereas other mechanisms restrict knowledge availability from the beginning, thereby inherently removing the risks of knowledge leakage. While control aspects may be more pronounced, these mechanisms also form the basis and provide tools for self-regulating, voluntary conduct by increasing predictability and affecting normative beliefs (Bulgurcu *et al.*, 2010). The above-mentioned mechanisms targeting knowledge leakage can also be used to protect foreground knowledge<sup>5</sup>; with their help, the output of innovation activities and created inventions can be kept confidential, as long as those creations are patented or otherwise protected.

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<sup>5</sup> Aside from this notion, foreground knowledge is beyond the scope of this study.

Since these mechanisms manifest at different stages of the innovation process, they might not be as common with regard to protecting the prerequisites of innovation as those that target knowledge leaving or that concentrate more explicitly on such protection. Yet, because mechanisms addressing knowledge leaving can also be effective in managing background knowledge, the more a firm is concerned with protecting its innovation prerequisites, the more likely it is to strive to strengthen the mechanisms preventing knowledge leaving. The following hypothesis captures this notion:

*Hypothesis 2: The motivation for protecting the prerequisites of innovation is positively related to the HR-related protection mechanisms that reduce knowledge leaving.*

### *3.2 Contextual issues: the role of organizational trust*

As noted above, the mechanisms restricting knowledge leaving and leaving exhibit different features so as to preserve the prerequisites for future innovation. In particular, those characteristics that make them coercive (i.e., enforcing compliance with protective rules and practices) or self-regulating (i.e., enforcing desired behaviours) may be quite important in relation to the mechanisms' efficiency (see Arthur, 1994). Prior research has suggested that control and trust can be combined into a hybrid form with beneficial outcomes (Bulgurcu *et al.*, 2010). We apply this idea to protective formalized and soft mechanisms and suggest that both are likely needed. However, we also suggest that genuine commitment and understanding and an acceptance of the need for control in relation to both types of mechanisms are necessary (see Adler and Borys, 1996; Hannah and Robertson, 2015).

Building on the theory of planned behaviour (Ajzen, 1991), Bulgurcu *et al.* (2010, p. 523) note that “employees who comply with the information security rules and regulations of the organization are the key to strengthening information security.” They state that the employees should be aware of the rules and that employee attitudes towards these rules depend on the employees' overall

perceptions of the positive and negative consequences of following or breaking the rules (e.g., intrinsic benefits, impediments to conducting tasks other than protecting knowledge, or sanctions). Employers, on the other hand, seek to affect attitudes through both rewards and punishments. The efficiency of these, however, is not only dependent on how employees perceive potential consequences, but also on employees having the internal motivation to follow their employers' interests (Hannah and Robertson, 2015). This motivation, in turn, largely depends on the employees' relationship with and, especially, trust in their employers.

Literature on organizational trust emphasizes the importance of perceived intentions and benevolence as determinants of the trust experienced by employees (Mayer *et al.*, 1995; McEvily *et al.*, 2003). Tyler *et al.* (2007) have suggested that employees are more willing to follow rules when they consider the originator of those rules to be legitimate—that is, when they trust the organization for which they work. Organizational trust is an employee's willingness to accept vulnerability based on positive expectations about an employer's intentions or behaviour (Blomqvist, 1997; Gilbert and Tang, 1998; Mayer *et al.*, 1995).

In his seminal article, Ouchi (1980) discusses compliance with internalized norms and self-control as a means for coordinated action in a clan type of organization. Furthermore, McEvily *et al.* (2003) argue that clans (and other forms of cooperative scenarios with potentially mixed-motive situations) rely on trust as an organizing principle. Trust affects the efficiency and effectiveness of communication (Blomqvist, 2002; Shockley-Zalabak *et al.*, 2000) and organizational collaboration (Blomqvist and Levy, 2006; Mayer *et al.*, 1995). It is a critical factor in terms of leadership (Tyler, 2003), job satisfaction (Shockley-Zalabak *et al.*, 2000; Timming, 2012), commitment (Aryee *et al.*, 2002; Bijlsma and Koopman, 2003; Dirks and Ferrin, 2001) and performance (Barney and Hansen, 1994). Employees are more likely to comply with rules when they perceive their personal values to be congruent with their leaders' (Gillespie and Mann, 2004) and employers' values (Tyler and Blader, 2005) and with the rules themselves (see, e.g., Jenny *et al.*, 2007). Further, Dirks and Ferrin

(2001) show that employees experiencing high organizational trust are willing to work towards shared goals instead of their own.

Organizational trust indicates that employees believe in the organization's actions ultimately benefiting the employees (Blomqvist, 1997; Gilbert and Tang, 1998). In the context of this study, this means that even if some protective practices might create challenges in terms of accomplishing everyday tasks smoothly (i.e., there are costs of compliance; see Bulgurcu *et al.*, 2010), employees might tolerate the disruptive effects better when they believe that an organization has good reasons for putting such measures in place (Hannah and Robertson, 2015). When there is organizational trust, the enactment of protective rules and policies is not easily interpreted as a sign of distrust (cf. Hannah, 2005), and those HR-related mechanisms selected to protect the prerequisites of innovation in the organization could become more efficient (e.g., Alfes *et al.*, 2012; Kuvaas, 2008). According to the knowledge-based view of the firm, organizational trust enhances knowledge exchange, employee identification, and commitment through shared expectations, values, and language (Foss, 1996; Kogut and Zander, 1992), while also providing a higher-order organizing principle critical for supporting engagement in voluntary action (Grant, 1996; Nonaka and Takeuchi, 1995; Nonaka *et al.*, 2000; Spender, 1996; von Krogh, 1998). In cases of trust-induced organizational identification and commitment, employees not only have higher costs of exiting and greater hesitance at leaving an organization with their valuable knowledge (Liebeskind, 1996), but may also share knowledge useful for protecting other knowledge; for example, more experienced employees could pass on rules related to confidential knowledge conduct, or novices may learn by watching and listening. Organizational trust could, thus, increase awareness of a range of knowledge management rules and their importance, along with expertise related to knowledge protection. In addition, while it is difficult to bind human resources to the firm, and though a certain degree of employee turnover is inevitable (Haesli and Boxall, 2005), a further benefit of organizational trust is its ability to increase the likelihood of departing employees respecting a firm's interests after they have left the

organization. In sum, we interpret organizational trust as being capable of reinforcing knowledge protection. In keeping with this interpretation, we hypothesize:

*Hypothesis 3: Organizational trust positively moderates the relationship between the protection of the prerequisites of innovation and the HR-related protection mechanisms that reduce knowledge leaving.*

*Hypothesis 4: Organizational trust positively moderates the relationship between the protection of the prerequisites of innovation and the HR-related protection mechanisms that reduce knowledge leaking.*

## **4 Methods**

### *4.1 Sample and data collection*

The four hypotheses were tested using survey data collected in Finland from companies with at least 100 employees engaged in R&D. Furthermore, to address concerns of eligibility and inclusion, we required independent strategic positioning with regard to R&D and human resource management (e.g., we expected some branches to be excluded). This information was verified by telephone during the first contact. The data were collected via structured questionnaires using the key-informant technique. We sought to contact two informants from each firm: one responsible for R&D issues (in most cases, a managing director, R&D manager, or development officer) and one responsible for human resources (typically an HR director/manager or managing director). The two questionnaires sent to the firms had some corresponding questions (e.g., questions on performance and basic information) and some sets of questions specific to the individual areas of expertise of the respondents. Responses covering the R&D portion were received from 213 companies, representing

a quite satisfactory effective response rate of 37.4% (213/570), and the survey instrument emphasizing HR was returned by 205 respondents (27.4%; 205/747<sup>6</sup>). For this study, we utilized data only from those companies from which responses were received from both R&D and HR representatives, and we matched the data in order to position the firm as the unit of analysis. Our final sample used to test the hypotheses comprised data on 80 firms. The majority of the firms operated in manufacturing, specifically in the following areas: manufacturer of other machinery (18.8%), chemical products (15%), metal products (10.0%), wood and paper products (7.5%), and electronics (5%). Other notable industries included administration and support services, including education (7.5%), wholesale and retail (6.3%), and information and communication (6.3%). Over half of the firms (50.8%) employed 100 to 250 people, around one-third (37.6%) employed 251 to 1000 people and the rest (11.6%) employed more than 1000 people. Half of the firms (50.3%) were under 20 years old, and 25% were under 10 years old. There were also a number of companies with extensive business experience: 19.1% had been established for more than 50 years.

## *4.2 Measures*

### *Independent variables*

Our independent variable was adapted from the work by Hurmelinna-Laukkanen and Puumalainen (2007). *Protection of innovation prerequisites* was measured using two items. Specifically, the respondents for this variable were R&D representatives, and they were asked to describe how they approached the protection of innovations and their prerequisites. The potential of distortion in the ways in which respondents considered knowledge protection motivations was taken into account in the wording of the items (since most studies address the protection of innovation output). The

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<sup>6</sup> The difference between the number of eligible respondents for the two surveys is because not all possible respondents for the R&D survey were reached even after several attempts. Thus, eligibility of those firms was not ensured and they were not included in the overall number of possible respondents.

respondents were specifically asked to evaluate the role of the background knowledge and reflect on the protection of the prerequisites, rather than the outputs, of innovations through wordings like “it is more important for our company to protect the prerequisites of innovativeness than innovations themselves”. The respondents rated the items on a seven-point Likert scale, in which higher values indicated higher inclinations to emphasize the protection of innovation prerequisites. Table 1 details the wording of the items.

### *Dependent variables*

HR-related protection mechanisms were addressed by asking the respondents (again R&D representatives) to assess the strengths of the mechanisms they used to protect their firms’ innovations and related knowledge (i.e., products, services and processes) against imitation by competitors over the last three years. A list of mechanisms followed, which the respondents rated on a seven-point Likert scale that was anchored with *not applicable to our innovations* (1), centred by *poorly* (2) and ended with *very well* (7). The study conducted by Hurmelinna-Laukkanen and Puumalainen (2007) and the Carnegie-Mellon Survey on Industrial R&D (see, e.g., Cohen *et al.*, 2002) were used in the item-development phase. The two items used to measure *knowledge leaving* addressed enhancing commitment and reducing personnel turnover. The eight items used to measure the prevention of *knowledge leaking* included the training of personnel, employers’ right of direction, the use of passwords and the use of NDAs. These items, therefore, covered legislation-based, contractual, concealment-related and HRM practices. The test of discriminant validity (described in more detail below) was applied to evaluate the measurements (see Table 1 for the wording of the items.)

### *Moderating variable*

*Organizational trust* was measured via nine items (see Table 1 for the wording of the items), which were partly adopted from Huff and Kelley (2003) and partly developed by the authors. These items covered competence, benevolence and reliability, as well as general trust in the organization. The respondents for this variable were HR representatives.

#### *Control variables*

Three measures—firm age, personnel and industry—were used as control variables to account for their potential effects on the HRM-related protection mechanisms. Firm age was measured in terms of years since establishment, and personnel was measured as the number of employees. For the industry classification, we used 16 classes based on NACE coding. We drew the control variables from the Amadeus database.

*[Insert Table 1 here]*

#### *4.3 Measurement models*

In order to test the measurement models, we assessed both internal consistency and discriminant validity using a Partial Least Squares (PLS) test. Measures of construct reliability (CR) and convergent validity reflect *internal consistency*. According to the CR test, all the constructs recorded a value above the threshold of 0.7 suggested by Bagozzi and Yi (1991) (see Table 1). In order to test for convergent validity, we examined CR, the factor loading and Average Variance Extracted (AVE). First, the loadings of all the items were high and statistically significant, meaning that they were all related to their specific constructs, thereby verifying the relationships posited among the indicators and constructs. Second, the AVE measure exceeded the cut-off point of 0.5

(see, e.g., Fornell and Larcker, 1981) in most of our constructs. Moreover, though it fell short in relation to the leaking of information, when all the criteria (i.e., high and significant factor loadings, as well as high CRs) for convergent validity were taken into account, this measure was also applicable.

As stated above, we argue that HRM-related protection mechanisms can be divided into those mechanisms related to leaving and those related to leaking. In order to test this argument, we performed a test of discriminant validity for these two constructs to indicate the extent to which any one construct differed from the others. In this assessment, the AVE should be greater than the variance shared between a given construct and the other constructs in the model (i.e., the squared correlation between two constructs) (Fornell and Larcker, 1981). The test showed that the AVE for knowledge leaving was 0.82 and that for leaking was 0.43, while the squared correlation was far lower (0.13) This strongly indicates that knowledge leaving and leaking are two distinct constructs.

In addition, we tested the discriminant validity of the constructs for our actual research models. These constructs also met the necessary criteria in our two models because their AVEs were greater than the squared correlations between them.

In sum, the model assessments offered good evidence of validity and reliability for the operationalization of the concepts.

#### *4.4 Assessment of bias*

The data relied on self-reported measures and, therefore, common method variance might have biased the findings. Common method bias is of particular concern when survey respondents are asked to address items covering both independent and dependent variables. We used Harman's one-factor test (Podsakoff *et al.*, 2003) to assess the risk of such bias and conducted a principal component analysis to incorporate all of the items from all of the constructs, despite sourcing

responses from two respondents in each organization. In order to determine the number of factors required to account for the variance of all items, we investigated the resulting solution and found that the largest factor accounted for 32% of the variance. Moreover, in line with Podsakoff *et al.* (2003), we tested a measurement model with one method factor, finding that the loadings were low and insignificant. Taken together, these tests suggest that common method bias was not a concern.

## **5 Results**

A model illustrating the hypothesized relationships was constructed, and the hypotheses were tested accordingly. We used a PLS test for the analyses. PLS-based structural modelling can be utilized with smaller sample sizes, such that a sample size of 80 was sufficient for our research model (see Hair *et al.*, 2014). In order to analyse the moderation effects, both the direct relations of the variables and the relations among the interaction terms were examined (cf. Baron and Kenny, 1986).

### *5.1 Correlation analysis*

Table 2 presents the correlation matrix, mean scores and standard deviations for all of the main variables.

*[Insert Table 2 here]*

### *5.2 Testing the research models*

Our models for examining direct effects explained 29% of the variance for knowledge leaving and 43% of the variance for knowledge leaking. In addition, our interaction models explained 35% of the variance for knowledge leaving and 48% of that for knowledge leaking. Following earlier examples in which hypotheses were specific and directional predictions were offered (e.g., this study's statement that the effects were positive), we applied one-tailed tests (cf., e.g., Bagger *et al.*, 2014; Buyl *et al.*, 2011; Hilmersson, 2013; Kang *et al.*, 2015). First, in order to test Hypotheses 1 and 2, results were obtained by first estimating the direct effect path models reflecting the posited relationship between a firm's motivation in protecting the prerequisites of innovation and the strength of its HR-related protection mechanisms. The path estimates from protecting the prerequisites of innovation and the mechanisms reducing knowledge leaving (H1) and knowledge leaking (H2) were as hypothesized (see Figure 1). Protecting the prerequisites had a significant, positive impact on the strength of HR-related mechanisms for reducing both the leaving ( $B = 0.431$ ,  $p < 0.005$ ) and leaking ( $B = 0.620$ ,  $p < 0.005$ ) of knowledge. These findings will be discussed in more detail below.

Next, we tested the possible moderation effect of organizational trust on the relationship between the goal of protecting the prerequisites of innovation and the strength of the two categories of HR-related mechanisms. As hypothesized, organizational trust proved to be a moderator in reducing both leaving and leaking. The results (see Figure 1) returned a path coefficient of 0.381 ( $p < 0.005$ ) for the protection of innovation prerequisites for knowledge leaving and one of 0.186 ( $p < 0.05$ ) from organizational trust to knowledge leaving, along with an interaction effect of 0.268 ( $p < 0.05$ ), with a total R-squared of 0.35. In addition, the results for the leaking of information produced a path coefficient of 0.618 ( $p < 0.005$ ) for the protection of innovation prerequisites, one of 0.127 ( $p < 0.10$ ) for organizational trust and one of 0.184 ( $p < 0.05$ ) for the interaction effect, with an R-squared of 0.48. For knowledge leaving, the size of the moderation effect was 0.10, and for

knowledge leaking, it was 0.12. In both cases, the size of the effect was medium, and the effect was significant (Chin *et al.*, 2003; Cohen and Cohen, 1983).

*[Insert Figure 1 here]*

To summarize, the results of the analyses support the hypothesized model and support all four hypotheses. The findings are discussed in the following.

## **6 Discussion of the empirical findings**

Our findings from the empirical analysis indicate that the more a firm focuses on protecting its background knowledge, the stronger its mechanisms of preventing knowledge leaving and leaking are. Knowledge leaking-related mechanisms are pronounced with regard to innovative output (foreground knowledge), but they are also relevant for safeguarding future innovations. While this finding is hardly completely unanticipated, it shows that protecting background knowledge as a strategic goal is, indeed, related to HR-related protection mechanisms, even if the strength of such HR-related protection would otherwise be considered relatively low in comparison to some other mechanisms available to firms (cf. the findings of Hurmelinna-Laukkanen and Puumalainen, 2007).

Furthermore, we found that the moderating effect of organizational trust is somewhat stronger in the context of knowledge leaving- than that of knowledge leaking-related protection mechanisms. One explanation could be that—in line with prior literature suggesting that trust reduces the need for control (Poppo and Zenger, 2002)—in the presence of strong organizational trust, companies rely more heavily on soft mechanisms. When organizational trust is weaker, these mechanisms might not be as effective. Trust is connected to commitment (Dirks and Ferrin, 2001; Nambudiri, 2012), and it may, therefore, manifest through employees being willing to stay with their firms. At the same time, the substituting effect may not be as relevant for reducing knowledge leaking. We

believe that these mechanisms grow stronger not because they are substituted for by trust, but because trust enhances employees' understandings of their roles and their toleration of even those mechanisms that may be inconvenient and difficult to follow when attempting to achieve goals at work (Bulgurcu et al., 2010; Hannah and Robertson, 2015). This could be why, though the moderating effect is statistically significant and positive for those mechanisms related to knowledge leaking, it is not as strong as it is in the case of leaving-related mechanisms. Furthermore, in the case of mechanisms related to knowledge leaking, trust can diminish the potentially harmful aspects of formalized mechanisms, thereby mitigating their potentially adverse effects (e.g., of some employees feeling that they are not trusted and, therefore, being unwilling to comply with company rules; see Hannah, 2005). Yet another issue is that the effect of organizational trust on knowledge leaking may be less pronounced than the importance of trust for knowledge leaving, since knowledge leaking can, by definition, encompass both unintentional and opportunistic dimensions (see Hoecht and Trott, 2006, on intentional knowledge leakage). In relation to the latter, organizational trust hardly plays a notable role: Even if employees believe that a firm is committed and that there are justified reasons for limiting access to and use of confidential knowledge, they might not care about these considerations when an opportunity for personal benefit arises. Therefore, even in the presence of strong organizational trust, firms need to use both formalized and restrictive, as well as soft and educative, types of mechanisms.

## **7 Conclusions**

In present-day markets, firms need to not only protect their innovative output, but also maintain such knowledge and skills that make it possible to continuously maintain developments and initiate innovations in different areas. In this study, we consider this to mean that it is not only important to pay attention to restricting the harmful imitative use of knowledge transferred beyond the firm, but

also to go to the sources of knowledge—and, further, to act to manage knowledge leaking and leaving. The conduct of employees, HR-related knowledge protection and the contexts within which protection mechanisms are to be applied are all important.

### *7.1 Theoretical contribution*

This study contributes to a number of areas that can be revealed through the identification of research gaps. At the general level, the discussion of HR-related mechanisms for knowledge protection resides at the intersection of the (innovation and) knowledge management (i.e., information security and the management of knowledge risks), strategic human resource management (i.e., control and commitment in the contexts of knowledge protection and employee compliance) and trust literatures. Thus, a simultaneous discussion of each of these areas is certainly warranted. The discourse on the ways in which knowledge management and HRM can be combined to support a firm's competitive advantage has been somewhat one-sided (Currie and Kerrin, 2003; Haesli and Boxall, 2005; Storey and Quintas, 2001), with a primary focus on the relationship between knowledge sharing and employees' willingness (Liu and Liu, 2011), or unwillingness or inability (Currie and Kerrin, 2003) to transfer knowledge. Any obstacles to knowledge exchange have largely been considered as problems to be addressed, meaning that the possibility of harnessing HR for knowledge protection has been rarely acknowledged. In particular, little is known of the purposes for which such mechanisms would be most appropriate (see Baughn *et al.*, 1997; Hurmelinna-Laukkanen and Puumalainen, 2007).

In scrutinizing employee conduct in the area of knowledge protection, researchers have tended to follow specific approaches, thereby unintentionally creating fragmentations. As Bulgurcu *et al.* (2010) point out, organization literature typically highlights the incentives for desirable behaviour, whereas information security literature often starts with referring to the sanctions available to deter

unwanted knowledge flows. Both control (i.e., highlighting employee compliance with various rules) and commitment (i.e., fostering intrinsic incentives for preferred behaviours) are certainly evident in the HRM literature (e.g., high-performance work systems) (Arthur, 1994; Su and Wright, 2012); however, again, the protection aspect is not particularly visible. Questions remain regarding whether coercion and self-regulation might be equally useful for mitigating different types of knowledge risks.

Finally, it has not been clear how trust—and organizational trust in particular—relates to different means to protect knowledge, and whether it gives rise, for example, to substituting or complementary forces with regard to different control mechanisms (see Aryee *et al.*, 2002; Dirks and Ferrin, 2001; Kogut and Zander, 1992; Zhang *et al.*, 2008). In the rare studies in which trust is coupled with protection, it has been mostly in relation to alliances, thus leaving intra-organizational trust and knowledge protection largely untouched (see Biljsma-Frankema and Costa, 2005; Costigan *et al.*, 1998; Weibel, 2007). Noticing such gaps, recent research (Eberl *et al.*, 2012; Searle and Skinner, 2011) has called for more work on combinations of variables in order to understand the role of trust. Only a few studies (see, e.g., Innocenti *et al.*, 2011) have taken up Dirks and Ferrin's (2001) call for moderation analyses in the context of HRM and trust.

Against this background, as a first contribution, our findings support and confirm a notion outlined in prior studies, according to which strategic goals and motivations are related to the use and strength of different mechanisms (Hall *et al.*, 2012). Whereas mechanisms like lead time, secrecy, and IPRs might be strongest for innovative outcomes (Cohen *et al.*, 2000; Hurmelinna-Laukkanen and Puumalainen, 2007; James *et al.*, 2013), our study suggests (in line with Olander *et al.*, 2009) that HR-related mechanisms gain relevance when the motivation is to protect the prerequisites of innovation. This might also explain why the findings regarding the use of HR-related mechanisms for protective purposes have been unambiguous; HR-related protection likely plays a more notable role in innovation input than innovation output. The use of different

mechanisms for the protection of background and foreground knowledge, however, requires further examination.

Second, we contribute to existing knowledge by providing empirical evidence on the distinction between the risks stemming from knowledge leaving and those caused by knowledge leaking. The individual HR-related mechanisms suitable to mitigate these kinds of risks fall into distinct categories, based on their suitability for managing the risks. In prior research, the distinction between knowledge leaving and leaking has been scarcely considered from the protection point of view. These risks have been previously addressed (e.g., Ahmad *et al.*, 2014; Agarwal *et al.*, 2009; Liebeskind, 1997; McEvily and Chakravarthy, 2002; Norman, 2001), but they have typically been considered only implicitly, as part of a wider discussion, or through the separate consideration of the different relevant aspects. In this study, we have been able to show that, while knowledge leaving and leaking seem to be quite similar with respect to their overall relationships to the strategic goal of protecting background knowledge and organizational trust, there are also some clear differences: Our results show that commitment is emphasized on the knowledge leaving side, while control plays a bigger role in managing the risks associated with knowledge leaking.

Finally, in addition to addressing contradictory findings in the field of knowledge protection, our findings indicate that trust can be either substitutive or complementary, depending on contextual factors. Considering the risks associated with knowledge leaving, which are addressed mainly through soft, commitment-enhancing mechanisms, substitution may occur because it is possible to replace direct control with trust-based self-regulation (cf. Alfes *et al.* 2012; Spreitzer and Mishra, 1999). For knowledge leaking risks managed through soft and formalized mechanisms, trust is the vehicle that makes formalized, often coercive mechanisms acceptable by tapping into employees beliefs in their employers' good intentions. Indeed, trust plays a crucial role in organizations in which knowledge and both interpersonal and intra-organizational collaboration are becoming indispensable (Carney, 1998; Cohen and Mankin, 2002; Tyler, 2003). Economic efficiency and

hierarchical levels are no longer the main organizing principles in an environment that is complex, rapidly changing, and dispersed (Clegg, 1999; Daft and Lewin, 1993). While trust could be considered a kind of lubricant to ease the management of knowledge, it also has the ability to strengthen actions taken. This also applies to the mitigation of knowledge leaving and leaking.

## *7.2 Practical contribution*

Based on our findings, managers would do well to introduce both formalized and soft forms of protection in order to mitigate the effects of both knowledge leaving and knowledge leaking. Building on the findings of this study, managers could prioritize among different categories and mechanisms, depending on the markets and industries in which they operate. The knowledge leaving- and leaking-related risk levels will likely vary, and over- and under-protection are avoidable if management pays attention to the different options. For example, since forced knowledge leaking-reducing mechanisms have adverse effects (e.g., Hannah, 2005), these should, perhaps, be minimised in surroundings in which knowledge leaving is a bigger challenge.

In addition, since HR-related mechanisms seem to be reinforced in situations of organizational trust, managers would be advised to actively promote practices that are predictable, evidently fair, and understandable in relation to procedures (see, e.g., Bowen and Ostroff, 2004; Gilbert and Tang, 1998; Wong *et al.*, 2012). This advice is especially applicable in industries and markets with high staff turnover. Furthermore, even if organizational trust is not as closely related to knowledge leaking-related mechanisms as it is to those addressing knowledge leaving, and even if complete substitution of control mechanisms with trust is, therefore, likely to be out of the question, those mechanisms that employees perceive as impediments to their work are unlikely to be respected if managers introduce them without proper justification (Bulgurcu *et al.*, 2010; Hannah and Robertson, 2015; Tyler *et al.*, 2007).

### *7.3 Limitations and further research*

This study, like any other, has certain limitations. First, our dataset, in covering only 80 firms, was quite small. Future studies with larger datasets might offer more rigorous empirical support for the hypotheses, especially in relation to the moderation effect and its size. Second, our data were gathered in a single Western European country. It is quite typical to find a high level of trust within organizations in Finland, and the provisions of labour legislation and contract law are relatively broad and well-established. The results might be different in countries with different cultural backgrounds and legal systems (Su and Wright, 2012, refer, for example, to Asian cultures being more hierarchical and more prone to control than self-regulation). We also acknowledge that our measure of organizational trust is not optimal, since it is based on perception rather than an aggregated evaluation of the personnel in each respondent firm. We explained clearly to the informants that they should try to give an honest evaluation of their situations, but we cannot be certain that our measures capture each situation accurately. In addition, organizational trust may vary within an organization, in which case even the aggregation might not reveal the whole truth. This presents an interesting avenue for future study, especially through in-depth case examinations. The research conducted in this study, along with its limitations, provides grounds for such further research.

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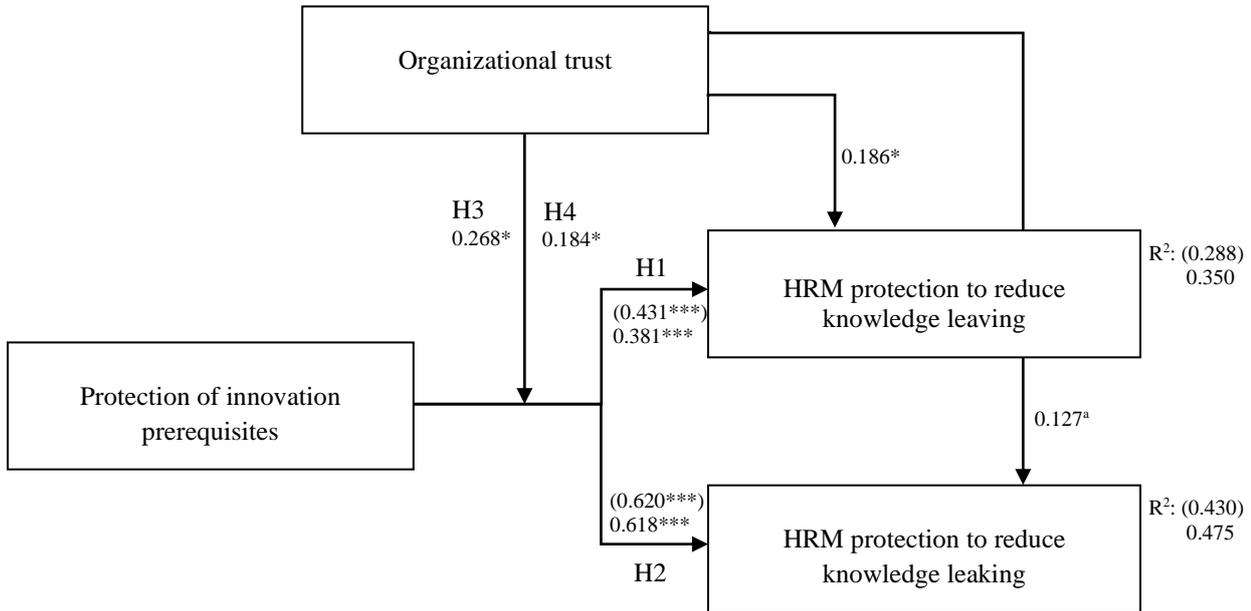
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**Figure 1 Results.**



Motives

Moderator

Strength of HRM-related protection mechanisms

**Notes:** \*\*\* Significance < 0.005 (one-tailed); \*\* Significance < 0.01; \* Significance < 0.05; <sup>a</sup> Significance < 0.10. The results for the direct effect models are presented in parentheses. For the clarity reasons control variables are not presented.

**Table 1:** Measurement items

CONSTRUCT	ITEM	MEAN	SD	FACTOR LOADING	AVE	CR
<b>REDUCING KNOWLEDGE LEAVING</b>	Making personnel committed to the firm (e.g. by offering perks)	4.31	1.80	.924***	.82	.90
	Small staff turnover/minimizing it	4.82	1.68	.890***		
<b>REDUCING KNOWLEDGE LEAVING</b>	Non-disclosure/confidentiality agreements	4.64	1.84	.617***	.43	.86
	Employees' non-competition agreements	3.35	1.90	.619***		
	The legal loyalty obligation of employees	3.52	1.82	.611***		
	The legal right of the employer to assign tasks	3.60	2.03	.475*		
	Educating personnel on IPR and secrecy issues	3.83	1.84	.710***		
	Sharing information with just a few	3.79	1.63	.544***		
	Using passwords	4.16	1.93	.810***		
Restricting access to meetings and the firm's premises	3.86	1.67	.776***			
<b>PROTECTION OF INNOVATION PREREQUISITES</b>	It is more important for our company to protect the prerequisites of innovativeness than innovations	4.01	1.83	.708***	.67	.81
	Our aim is always to retain innovation enabling knowledge within the company	5.03	1.44	.917***		
<b>ORGANIZATIONAL TRUST</b>	If someone in our company promises something, others trust that the promise will be kept	5.71	.96	.664***		
	Our company knows its strengths and where it is aiming for	5.61	.85	.773***		
	Top management has made it clear that our organization does not tolerate unethical behavior	6.08	.89	.410*		
	Our company strongly emphasizes informing the staff of things important to them	5.38	1.09	.738***		
	In our company we try to kill inaccurate rumors at once	5.50	1.04	.749***		
	In our company problems are not hidden but handled openly	5.29	1.20	.886***		

	Our company emphasizes fair and just practices	5.92	.95	.838***	.53	.90
	We do a lot of work to make our staff trust our company	5.80	.95	.752***		
	Our employees have trust in our company	5.68	.82	.545***		

**Notes:** \*\*\* Significance < 0.005; \*\* Significance < 0.01; \* Significance < 0.05; <sup>a</sup> Significance < 0.10.

**Table 2.** Correlation matrix

	<i>Mean</i>	<i>SD</i>	<i>1</i>	<i>2</i>	<i>3</i>
1. Protection of innovation prerequisites	4.52	1.36			
2. Knowledge leaving	4.57	1.58	0.424**		
3. Knowledge leaking	3.84	1.20	0.575**	0.371**	
4. Organizational trust	5.66	0.72	-0.026	0.083	0.136

**Notes:** \*\* Correlation is significant at the 0.01 level; \* Correlation is significant at the 0.05 level