To protect or not to protect? Renewal capital, knowledge protection and innovation performance

Paavo Ritala, Aino Kianto, Mika Vanhala and Henri Hussinki

Abstract

Purpose – *Firms need to constantly renew themselves to keep up with the pace of competition and proactively establish innovations to the markets. This requires capabilities in learning and renewing of the firm's knowledge base, conceptualized as renewal capital of the firm. On the other hand, firms that acquire high levels of competitiveness by renewing their knowledge base also need to protect that knowledge from unwanted spillovers. This study aims to examine how renewal capital affects incremental and radical innovation performance of the firm, moderated by the firm's protection of its strategic knowledge.*

Design/methodology/approach – *The study is based on a multi-industry survey study with a time-lagged data set, with independent variables collected in the first wave, followed by a second wave four years later for the dependent variables. The authors test the hypotheses using partial least squares structural equation modeling.*

Findings – *The authors find that firms' renewal capital is positively associated with the level of incremental and radical innovation. Furthermore, the authors find that knowledge protection negatively moderates the relationship between renewal capital and incremental innovation performance of the firm. In case of radical innovation performance, similar moderating effect is not statistically supported.*

Originality/value – *With a time-lagged research design, this study study reveals the interdependent roles of renewal capital and knowledge protection for firm's innovation performance, and provides insights of when (and when not) it would be beneficial for a firm to seek renewal and protective oriented approaches.*

Keywords *Renewal capital, Knowledge protection, Innovation performance, Incremental innovation, Radical innovation*

Paper type *Research paper*

1. Introduction

To keep up with the competition, firms need to constantly renew their capabilities, resources and ways of operating (Teece *et al.*, 1997). In intellectual capital (IC) research, these dynamic learning and renewal abilities of the firm have been conceptualized as *renewal capital* (Edvinsson and Malone, 1997; Miller, 1999; Kianto *et al.*, 2010; Inkinen *et al.*, 2017). In addition to constantly renewing firm's knowledge base, protection of those knowledge assets is also relevant to reap benefits from innovation (Teece, 1986; Liebeskind, 1996). In general, it has been shown that leakage of knowledge is detrimental for firms' innovation performance (Ritala *et al.*, 2015). Therefore, firms need to use variety of protection mechanisms to retain proprietary knowledge within the firm boundaries (Hurmelinna-Laukkanen *et al.*, 2008; Thomä and Bizer, 2013).

Our study focuses on the firm's capabilities in renewal and protection of knowledge, and the impact of these capabilities to incremental and radical innovation performance of the firm.

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This setting calls not only to understand the potential synergies or conflicts between firm's pursuits to learn and renew, but also protect its knowledge base. Existing literature has provided mixed implications in this regard. On the one hand, creativity and learning might suffer under the influence of strict knowledge protection; creative behavior by nature strives from variety of interaction (Perry-Smith, 2006), while knowledge protection aims to limit flow of knowledge across organizational boundaries (Manhart and Thalmann, 2015). On the other hand, sufficient level of knowledge protection might be beneficial for firms as they can then engage with other stakeholders with less fears of misappropriation (Ritala and Hurmelinna-Laukkanen, 2013). Therefore, as firms need to simultaneously focus on renewal and in knowledge protection, this pursuit might result in contradictory or paradoxical tensions (Fernandez and Chiambaretto, 2016), which could in turn lead to reduction of firms' innovation performance. These arguments are often bundled under the concept "paradox of openness," where it is pointed out that firms need to simultaneously combine openness and knowledge disclosure with appropriability (i.e. ensuring value capture from that knowledge) in their relationships (Laursen and Salter, 2014; Chesbrough *et al.*, 2018; Cappa *et al.*, 2021; Ritala and Stefan, 2021). One further stream of studies has argued that improved knowledge protection mechanisms allow firms to be more oriented to learning, renewal, collaboration and innovation, given the lowered threats of knowledge leakage (Jiang *et al.*, 2016; Henttonen *et al.*, 2016). For instance, Ritala and Hurmelinna-Laukkanen (2013) found that simultaneous ability to acquire knowledge, coupled with high levels of appropriability mechanisms, creates better innovation outcomes in interfirm settings (see also Estrada *et al.*, 2016).

As witnessed from the above discussion, the existing literature is not fully conclusive as to whether renewal capital and knowledge protection could be seen as complements or substitutes in driving firms' innovation performance. While the role of each of these constructs separately has gathered attention, their interplay is not fully understood. Thus, the implications of pursuing simultaneously both renewal- and protection-oriented approaches to knowledge represents an interesting research opportunity that can enrich our understanding of the best suited strategies for firms that aim to generate both incremental and radical innovations. In this study, we examine how renewal capital affects incremental and radical innovation performance of the firm, moderated by the firm's protection of its strategic knowledge. We hypothesize that renewal capital has a positive relationship with firms' incremental and radical innovation performance, while knowledge protection negatively moderates these relationships. This is based on our expectation that the high focus on knowledge protection will impede firms' renewal efforts and innovation, because of lessened access to reciprocal knowledge sharing and learning opportunities.

We test our hypotheses with a multi-industry survey study conducted in Finland for firms with at least 100 employees each. We expect that choosing a sample of Finnish firms of this size reflects broadly the strategic posture of European or at minimum Nordic country context in terms of firms' innovation activities; however, the generalizability of the results might be limited in other contexts with different legislative or institutional framework. We use a time-lagged research design, where data on independent and moderating variables are collected in 2013, and dependent variables in 2017. Using a partial least squares (PLS) model, we find that renewal capital positively predicts the levels of incremental and radical innovation, and that knowledge protection negatively moderates the relationship between renewal capital and incremental innovation performance of the firm. We do not find significant interaction effect for these variables for radical innovation.

These results provide interesting insights into firms' strategic configurations related to learning and renewal and simultaneously protecting the accumulated core knowledge. The key implication is that while knowledge protection might be necessary for innovating firms, overutilization of it might become harmful for innovation performance for firms that adopt major orientation on renewal and learning. On the other hand, firms with radical innovation

aims might more readily use “high renewal–high protection” strategies when necessary. In the following sections, we discuss the theory and hypotheses, followed by methods and results and finally discuss the implications and contributions of the study.

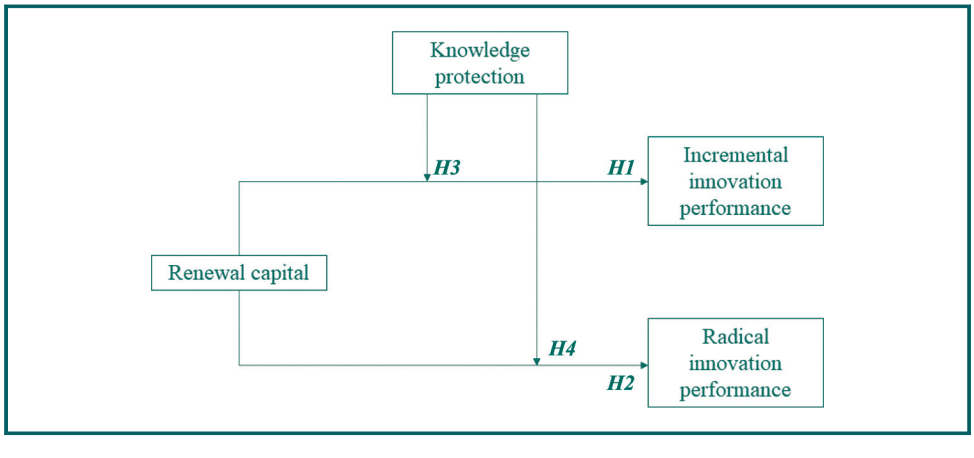
2. Conceptual background and hypotheses

In this section, we develop the conceptual background and hypotheses for the role of renewal capital and knowledge protection for firm’s innovation performance. Our hypothesized model (Figure 1) argues that renewal capital has positive effects on both incremental and radical innovation performance and that knowledge protection functions as a negative moderator for both direct effects. Incremental innovation refers to the innovations that improve the firm’s current products, services and processes and radical innovations to completely new or changed products, services and processes; in this study, we are particularly interested in firm innovation performance, which refers to the relative performance in comparison to firms’ competitors in terms of incremental and radical innovation (Subramaniam and Youndt, 2005). The reasoning relies on viewing first the learning and renewal efforts as a key driver of innovation (as argued in the creativity and learning literatures; Crossan *et al.*, 1999; Zahra and George, 2002), and second, knowledge protection as a contingency factor affecting the appropriability conditions of innovation (Teece, 1986; James *et al.*, 2013) and therefore modeled as a moderator variable in our study between renewal capital and innovation performance.

2.1 Renewal capital and innovation performance

Renewal capital is one of the constituent elements of an organization’s IC (Edvinsson and Malone, 1997; Kianto *et al.*, 2010; Inkinen *et al.*, 2017). In an organizational context, the concept of IC refers to all the stocks and flows of knowledge that can be leveraged to create value and competitive advantage (Nahapiet and Ghoshal, 1998; Youndt *et al.*, 2004). While the most typical approach to specify IC is to divide it into three sub-dimensions of human capital, relational (or social) capital and structural (or organizational) capital (Subramaniam and Youndt, 2005; Reed *et al.*, 2006), recent literature (Tseng and Goo, 2005; Nazari and Herremans, 2007; Kianto *et al.*, 2010; Cesaroni *et al.*, 2015; Buenechea-Elberdin *et al.*, 2017; Inkinen *et al.*, 2017; Rehman *et al.*, 2021) has suggested that renewal capital should be acknowledged as an important facet of IC, as it indicates an organization’s capability to survive in changing conditions. In this study, we focus solely on this aspect of IC.

Figure 1 Research model



Renewal capital represents the firm's ability to learn and to renew its knowledge base (Kianto *et al.*, 2010). It is an integral part of the intangible, knowledge management related issues, which contribute to organizational performance and value creation. As renewal capital addresses the ability of the organization to continuously learn and innovate to sustain, adapt and recreate its knowledge, it is also linked with the dynamic capabilities view of strategy (Teece *et al.*, 1997), which addresses the sources and processes leading to competitive advantage during conditions of rapid change. Because learning is an important mechanism for knowledge renewal, it is also related with organizational learning theory (Crossan *et al.*, 1999). Another closely related concept is that of absorptive capacity, which addresses ability of an organization to assimilate and apply new external information to commercial ends (Cohen and Levinthal, 1990, 128; Jiang *et al.*, 2016), or the routines and processes that organizations use to acquire, assimilate, transform and exploit knowledge (Zahra and George, 2002, 186). However, absorptive capacity concept has typically been used to refer to dealing with knowledge that originates externally to the firm (for a critique, see Lewin *et al.*, 2011), mostly in the context of R and D activities (Lane *et al.*, 2006), whereas renewal capital also encompasses pro-active and creative internally induced knowledge creation. In addition, renewal capital includes the generic knowledge and skills development beyond functional boundaries, hence emphasizing more the tacit dimension of knowing (Polanyi, 1966/1990). As the focus of this paper is on knowledge-related tensions between firms' efforts to be simultaneously creative as well as protective, we have chosen to focus on the phenomenon of renewal capital in this study.

Innovation, i.e. development of a value-creating novelty, is essentially a knowledge-based issue (Nonaka and Takeuchi, 1995). Production of innovations hinges on the ability to leverage and integrate various types of knowledge assets from multiple sources (Tidd and Bessant, 2009). Knowledge is needed in all phases of the innovation process, from developing and identifying new ideas, to enabling the testing and application of them, as well as to supporting adoption and distribution of them (Leonard-Barton, 1995). Hence, previous literature has widely seen knowledge as a key driver of innovation. The impact of IC on innovation performance has been a subject of active research (Cabrilo and Dahms, 2018; Paoloni *et al.*, 2020; Rehman *et al.*, 2021; Mahmood and Mubarik, 2020; Ali *et al.*, 2022). However, a recent structured literature review of the empirical work on the topic (Buenechea-Elberdin, 2017) found that the role and impact of different IC elements on innovation varied a great deal across different studies, ranging from very important to non-significant. In addition, renewal capital is a relatively overlooked dimension of IC, with most of the studies addressing either two (human and structural capital) or three (human, structural and relational capital) aspects of IC (Tseng and Goo, 2005). This is a rather surprising finding, because innovation in essence is a question of renewing, extending and modifying organizational knowledge (Nonaka and Takeuchi, 1995; Leonard-Barton, 1995).

Even though other knowledge assets have a potential to improve innovation performance, we argue that renewal capital as a realized capability is the IC element that most directly influences it. As Ray *et al.* (2004, 26), point out, "resources, by themselves, cannot be a source of competitive advantage. That is, resources can only be a source of competitive advantage if they are used to 'do something'." We argue that the same applies to the relationship between the traditional IC elements and renewal capital. Renewal capital as the actualized learning of the firm stands for the ability of the firm to develop and further its knowledge, which makes it the key knowledge-based asset predicting innovation performance.

Renewal capital consists of the ability of the firm to acquire new information, develop skills and to learn. An organization with high renewal capital can build on previous knowledge and generate new knowledge (Chen *et al.*, 2004; Tseng and Goo, 2005; Maditinos *et al.*, 2010). The firm's ability to learn and to renovate its knowledge base has been widely linked to innovation (Hurley and Hult, 1998; Hsu and Fang, 2009). Knowledge renewal and

learning have been demonstrated to support, e.g. the development of new products, processes and management mechanisms (Jimenez-Jimenez *et al.*, 2008; Sanz-Valle *et al.*, 2011), as well as innovation on both individual and organizational levels (Wang and Ellinger, 2011). Several empirical studies have found renewal capital to be a key antecedent of innovation performance (Buenechea-Elberdin *et al.*, 2017; Cabrilo *et al.*, 2018; Cabrilo and Dahms, 2020) and organizational performance in general (Tseng and Goo, 2005; Cesaroni *et al.*, 2015). There is also evidence (Tseng and Goo, 2005; Buenechea-Elberdin *et al.*, 2017) that renewal capital mediates the impact of other IC elements on firm performance outcomes. However, previous studies on the link between renewal and innovation have used a unidimensional measure of innovation performance, and to the best of the authors' knowledge, no previous study has examined the impact of renewal capital on different types of innovations (incremental vs radical). In the following, we will separately form hypotheses for the effect of renewal capital on incremental and radical innovation performance of the firm.

Incremental innovations are small-scale developments and improvements to the current products, services or processes of a firm. From a knowledge-based perspective, high performance in executing such innovations is based on a capacity to refine and reinforce existing knowledge and competencies (Subramaniam and Youndt, 2005) and to apply those new knowledge sets to promote a gradual development of the firm's offerings. Both of these mechanisms, exploiting the deepening and widening of the current knowledge of the firm (March, 1991) and recombination of knowledge into new knowledge patterns (Savino *et al.*, 2017), can lead to development of incremental innovations (Carnabuci and Operti, 2013). Therefore, such innovations stem from gradual developments to the previous knowledge assets (Kang and Snell, 2009), convergent thinking processes (Taylor and Greve, 2006) and application of intra-firm specialized knowledge (Grant, 1996), expanded by a local search for incremental development opportunities (Fleming, 2001). Renewal capital, i.e. development and acquisition of new skills and understanding, not only builds new pieces of knowledge but also potentially enables forming new connections among the learned elements that have already been known to the firm, but not interconnected in a particular manner. The renewed knowledge provides a basis that the firm can use to add and amend to its current knowledge, as well as to generate new linkages between the existing knowledge elements in well-known manners. Consequently, a firm with a high renewal capital is able to recombine the knowledge existing among its actors and networks (Carnabuci and Operti, 2013), enabling the firm to tap on a wide spectrum of existing knowledge elements and to combine them in well-understood ways (Savino *et al.*, 2017), allowing it to innovate incrementally by building on the competences that it already currently excels in (Tushman and Anderson, 1986):

H1. Renewal capital improves incremental innovation performance of the firm.

Radical innovation differs from incremental because it requires tapping on a broader, more diverse and more distant sets of knowledge (Fleming, 2001). Radical innovations transform the existing products, services or technologies of the firm. Radical innovations are based on a capacity to conduct competence-destroying changes on the firm's knowledge (Tushman and Anderson, 1986) as they require a radical departure from and disruption with existing routines and practices of the firm (Damanpour, 1991). Achieving radical innovations stems from renewing knowledge in an explorative, rather than exploitative manner (March, 1991), and is an application of divergent thinking (Taylor and Greve, 2006). While on one hand renewal capital benefits local search, exploitation, and related incremental innovation, on the other hand it also enhances radical innovation outcomes through creativity and inventiveness. A firm with high renewal capital is able to experiment, improvise and apply trial and error as learning mechanisms (Zahra *et al.*, 2006) and thereby not only to generate a variety and diversity new knowledge elements, but moreover to combine and recombine those in novel ways (Savino *et al.*, 2017) and create new knowledge combinations required

for radical innovations. Such new knowledge may manifest as completely new-to-the-world insights and inventions, and also as imaginative reframings or redefinitions of the problems at hand (Bessant *et al.*, 2014). Thus, renewal capital improves radical innovation performance through enabling the transformation of the existing knowledge base of the firm which then can be combined in novel ways to produce radical innovations (Carnabuci and Operti, 2013), leading to the generation of significantly transformed offerings and organizing methods:

H2. Renewal capital improves radical innovation performance of the firm.

2.3 Moderating role of knowledge protection

While renewal capital is an important feature for organizational ability to create new knowledge and eventual innovations, firms also need to consider how to appropriate value from innovation (Teece, 1986). From this viewpoint, literature has suggested reaping innovation benefits often requires applying dedicated knowledge protection mechanisms (James *et al.*, 2013; Ritala and Hurmelinna-Laukkanen, 2013). In this study, we argue that while knowledge protection is important for reaping innovation benefits, at the same time, it acts as a restricting mechanism for firms that are particularly renewal oriented. We assume that a highly protective approach will result in firms' employees to restrict knowledge flows with both internal and external stakeholders to the firm. This assumption is the basis on which we argue that firms deploying an overly protective orientation will suffer from missed opportunities to share and receive knowledge, even if we do not measure the knowledge flows directly. In particular, high emphasis on protection might make the firms and their employees unable to engage in reciprocal knowledge sharing in different contexts (Tranekjer and Knudsen, 2012; Caimo and Lomi, 2015; Loebbecke *et al.*, 2016), leaving the firms with lower number of combinatory knowledge search opportunities (Savino *et al.*, 2017). For firms that involve high renewal capital, the combinatory search benefits will be thus dampened by overly protective approaches. Existing literature provides indirect support for these arguments. For instance, Laursen and Salter (2014) demonstrated the high levels of appropriability mechanisms used in a firm lead to lower emphasis in external collaboration. Meanwhile, it is known that organizational renewal and learning require high amount of collaboration with external stakeholders, as discussed broadly, e.g. in open innovation and collaborative innovation literatures (see e.g. West and Bogers, 2014). Therefore, being renewal oriented and at the same time highly protective causes a strategic contradiction, where simultaneous pursuit of learning and knowledge development might become at odds with protectiveness and secrecy. In other words, it will be somewhat difficult to "get the best of both worlds." Based on these arguments, we generally expect knowledge protection to have a negative moderating role on the relationship between renewal capital and innovation performance of the firm.

In terms of incremental innovation, which relies on gradual developments from the existing knowledge domain, too high emphasis on knowledge protection might be at odds with renewal initiatives. Incremental innovation benefits particularly from collaboration among wide variety of internal and external stakeholders that enable the focal firm to internalize and apply knowledge to develop improved technologies and offerings. For instance, competitors are a particularly feasible source of knowledge regarding incremental innovation (Nieto and Santamaría, 2007; Ritala and Hurmelinna-Laukkanen, 2009); however, knowledge protection is often focused on excluding knowledge from competitors (Teece, 1986; James *et al.*, 2013). Similarly, focusing on knowledge protection will make it more difficult for firm's employees to engage in reciprocal sharing of knowledge in a variety of industry networks such as trade associations (Pinnington *et al.*, 2021), where much of the incremental developments are discussed. Similarly, in a multi-national or a large conglomerate company, protective approach between different units might become a hindrance for knowledge sharing and related learning (Tsai, 2002). Being overly protective will thus restrict the firms' abilities to communicate about innovation with different internal

and external stakeholders, lessening the abilities to receive useful knowledge reciprocally in return (Loebbecke *et al.*, 2016). This might be particularly harmful as incremental innovation involves low distance between innovation and current knowledge base of actors, providing feasible opportunities to quickly combine and integrate knowledge across domains (Savino *et al.*, 2017).

In summary, renewal capital benefits incremental innovation via close elaboration of current knowledge domains that are extended iteratively via interactive learning with internal and external stakeholders. We argue that these benefits are suppressed with strongly protective approaches to knowledge; working with incremental developments becomes harder as the firm's employees become hesitant, unsure or unwilling in terms of reciprocal learning and development opportunities. In incremental innovation, the low distance between the attempted developments and the current knowledge base signifies the problem; reciprocal learning might be hampered as firm's employees cannot interact with the close stakeholders and collaborators. Based on these arguments, we expect that high levels of knowledge protection will lead to lesser opportunities to harness the benefits of renewal capital on incremental innovation performance:

H3. Knowledge protection negatively moderates the relationship between renewal capital and incremental innovation performance of the firm.

For radical innovation, we also expect that knowledge protection has a negative moderating role, for partially similar but also distinct reasons. For creation of radical innovation, external ideas and integration of various types of knowledge is particularly important (Zhou and Li, 2012), involving a distant search of knowledge elements (Fleming, 2001). At the same time, protecting radical innovation-related knowledge is highly relevant, because disseminating it too widely might end up the focal firm in losing the novelty value of the innovation (Ritala *et al.*, 2018). Therefore, firms' attempts to protect their knowledge, coupled with high renewal orientation, can be expected as a difficult match for radical innovation performance. While there are ways to "selectively reveal" knowledge while keeping other parts protected (Alexy *et al.*, 2013), the overall aim toward radical innovation might be impeded with overly protective approach because firms will have difficulties to engage into distant search that draws from reciprocal exchanges of knowledge with variety of stakeholders (Tranekjer and Knudsen, 2012; Loebbecke *et al.*, 2016). Simply put, creative and inventive firms that also adopt a high knowledge protection will have less opportunities to combine the different creative outputs with other stakeholders' knowledge elements (Savino *et al.*, 2017), leading to lower possibilities for radical innovation.

In summary, renewal capital benefits radical innovation via providing opportunities to combine distant and novel knowledge combinations. However, a strongly protective approach could hamper these learning and recombination attempts; when firm's employees pursue for radical combinations, but are unable to share their own knowledge, they might miss out from the most useful knowledge sharing and integration opportunities. For these reasons, we expect a negative moderating effect for knowledge protection:

H4. Knowledge protection negatively moderates the relationship between renewal capital and radical innovation performance of the firm.

3. Methods

3.1 Research design and data collection

We used statistical survey research strategy, using structural equation modeling (SEM) with the SmartPLS3 software. To test the model with a true causal logic (i.e. time lag between independent as well as moderating variables and dependent variables), we used two data sets, collected in years 2013 (N = 259) and 2017 (N = 221) from Finnish firms with at least 100 employees. The independent and moderating variables were collected in year 2013,

and dependent variables (incremental and radical innovation performance) were collected in 2017. After merging the two data sets, we ended up with a smaller cross-industrial data set of 96 companies where the same companies had responded to both surveys. In both data collection phases, all firms were contacted by an external research company by telephone and the person in charge of the human resources was asked to respond to the questionnaire. The key informant technique was used to collect data from one respondent per company.

In terms of industry, most of the respondents represented manufacturing (37.2%) and wholesale and retail trade (18.1%). Transportation and storage (8.5%), services (8.5%), professional, scientific and technical activities (7.4%) and construction (7.4%) were other notable industries. Most of the respondents held the key position regarding the issues of IC: human resources director of manager (71.9%), other type of director or manager (11.5%) and managing director (7.3%). This indicates their expertise on the matters under scrutiny.

3.2 Measures

The wording of the items and anchoring of the scales for all the measures are presented in Table 1.

For the *independent variable*, renewal capital, we used Inkinen *et al.*'s (2017) four-item measure. The respondents were asked to evaluate to what extent the statements related to development and reinvention apply to their company.

The scales for the *dependent variables*, i.e. incremental and radical innovation performance of the firm, were based on a work by Subramariam and Youndt (2005), and for both, the

Table 1 Measurement items, CR and AVE

Concept	*Item*	*Factor loading*	*CR*	*AVE*
Renewal capital	*To what extent do the following statements on renewal apply to your company? (1 = completely disagree, 5 = completely agree)*		0.88	0.64
	Our company has acquired a great deal of new and important knowledge	0.788***		
	Our employees have acquired a great deal of important skills and abilities	0.800***		
	Our company can be described as a learning organization	0.820***		
	The operations of our company can be described as creative and inventive	0.790***		
Knowledge protection	*To what extent do the following statement on knowledge protection apply to your company? (1 = completely disagree, 5 = completely agree)*			
	Our company's strategic knowledge is protected from those stakeholders to whom it is not intended	one-item measure		
Incremental innovation performance	*How would you rate your organization's capability to generate the following types of innovations in the products/services you have introduced over the past year? (1 = weaker than competition; 4 = similar to competition; 7 = stronger than competition)*		0.88	0.71
	Innovations that reinforce your prevailing product/service lines	0.882***		
	Innovations that reinforce your existing expertise in prevailing products/services	0.789***		
	Innovations that reinforce how you currently compete	0.847***		
Radical innovation performance	*How would you rate your organization's capability to generate the following types of innovations in the products/services you have introduced over the past year? (1 = weaker than competition; 4 = similar to competition; 7 = stronger than competition)*		0.88	0.78
	Innovations that make your prevailing product/service lines obsolete	0.896***		
	Innovations that fundamentally change your prevailing products/services	0.875***		

Note: ***Statistically significant at 0.01 significance level

initial scale consists of three items. The respondents were asked to rate their organization's capability to generate innovations in the products and services they have introduced over the past year. An example item for the incremental innovation performance was "Innovations that reinforce your prevailing product/service lines" and for the radical innovation performance "Innovations that make your prevailing product/service lines obsolete." While subjective performance measurement has its limitations, we chose to rely on it because of the absence of suitable objective measures for firms in our sample, as well as the support from the previous literature on the sufficient reliability of subjective assessment of performance (Ketokivi and Schroeder, 2004). In the phase of measurement model testing, we removed one item from the radical innovation performance due the low and insignificant factor loading.

Moderating variable, knowledge protection, was measured with a three-item measure by Hussinki and colleagues (reported first time in Hussinki *et al.*, 2017). The respondents assessed to what extent do the statements on general as well as formal and informal knowledge protection apply to their company. An item for the general knowledge protection was "Our company's strategic knowledge is protected from those stakeholders to whom it is not intended," for the formal protection "If necessary, our company uses patents, agreements, legislation and other formal means to protect its strategic knowledge" and for the informal protection "If necessary, our company uses confidentiality, employee guidance and other informal means to protect its strategic knowledge."

However, during the measurement model testing, we decided to drop two items concerning the formal and informal protection. An item covering informal protection was dropped because of low and insignificant factor loading. After that, the scale was conceptually inconsistent because it covered general protection and only formal protection. Consequently, we decided to drop also the item related to formal protection to have an unbiased measure with a good content validity. In the remaining item, the respondents assessed to what extent does the statement on protection of strategic knowledge apply to their company, and particularly "whether the knowledge is protected from those stakeholders to whom it is not intended." The wording of the item includes an assumption that the informants will evaluate stakeholders as any internal or external actors from whom the knowledge is protected from. This includes, and aligned with what is discussed in *H3* and *H4*, internal stakeholders via which unwanted knowledge spillovers might accrue, as well as external stakeholders such as competitors. This assumption relies on the informants' ability to assess the salience of particular stakeholders in the context of knowledge protection.

Three measures – number of personnel, industry and R&D intensity – were used as *control variables* – to eliminate the effects they might have on innovation performance. As a proxy values for firm size, we used number of employees. For the industry variable, we used an adapted classification of eight classes based on the "Statistical classification of economic activities in the European Community" (NACE Rev. 2). In the analysis, we included dummy variable (manufacturing vs all other industries). Intensity on research and development activities was reported by the respondents as a percentage of R&D staff of all employees in 2016. We used the natural logarithmic transformation of the variable for the analysis.

3.3 Assessment of common method bias

Even though we collected data in two waves, and in such way minimizing the risk of common method bias (CMB), the data collection still relied on self-report measures, and it might be that in some companies the respondent for the independent, moderating and dependent variables could be the same person. Thus, common method variance might have biased the findings in that regard. CMB is of particular concern when respondents are asked to address items that relate to all variables. Following relevant precedents from the literature (Minbaeva *et al.*, 2012), we took several steps to reduce the risk of such bias.

First, to reduce any risk that respondents might alter their answers to align with the expectations of others, the survey design and administration explicitly assured respondent confidentiality (cf. Tsai and Ghoshal, 1998; Minbaeva *et al.*, 2012). We also consulted with practitioners in the field to improve the scale items and used clear wording and understandable terminology to keep the survey concise (MacKenzie and Podsakoff, 2012). The fact that the surveys asked experienced respondents to assess concrete constructs further reduced the possibility of CMB (Rindfleisch *et al.*, 2008; MacKenzie and Podsakoff, 2012). Moreover, anchoring of the scales varied in our survey (different for innovation performance than for renewal capital and knowledge protection), thus helping to further decrease the possibility of CMB (Podsakoff *et al.*, 2003; Rindfleisch *et al.*, 2008; MacKenzie and Podsakoff, 2012).

To assess the risk of CMB further, we performed statistical analysis. In line with Podsakoff *et al.* (2003) and following the procedure suggested by Liang *et al.* (2008), a measurement model that included one method factor was also tested, allowing items to load both on their theoretical constructs and on a common method factor. Loadings on the method factor were substantially lower than those on the construct factors. Finally, our analyses with the PLS (see Section 4) revealed high discriminant validity, which further decreases the concern of CMB (Ahammad *et al.*, 2017). Taken together, these tests suggest that CMB was unlikely to be a major concern.

3.4 Assessment of non-response bias

A *t*-test was carried out to confirm the absence of non-response bias. We compared 96 respondents of this study against the other respondents in first and second data collection waves. The purpose was to show that there was no kind of bias between companies included in our study and rest of the companies. The responses regarding both the independent (renewal capital) and the moderating (knowledge protection) variables used in this study were compared with 166 respondents of the first data collection. The results indicated that there were no statistically significant differences between the groups. This was also the case with the dependent variables (incremental and radical innovation performance). The responses of 96 respondents regarding the innovation performances were compared with 125 other respondents in the second data collection. Again, no statistically significant differences between the responses were found. In sum, it could be concluded that non-response bias is not a major concern in our study.

4. Results

4.1 Structural equation modeling approach

We used PLS-SEM for the analyses (version 3.2.7 of SmartPLS; see Ringle *et al.*, 2015) and followed the process suggested in the literature (Hair *et al.*, 2014; Hair *et al.*, 2020). The first step was to assess the reliability and validity of the measurement models. We then used the structural model to test our hypotheses. To analyze moderation effects, the direct relations of the variables and the relation of the interaction term were examined (Baron and Kenny, 1986).

To simultaneously address multiple and complex relationships (Ahammad *et al.*, 2017) using PLS-SEM is appropriate because it is exploratory in nature and is based on minimizing the residual variance of the dependent variables. It therefore makes more modest demands on data compared with other SEM techniques (Hair *et al.*, 2014). In addition, PLS-based structural modeling can be used with smaller sample sizes (Hair *et al.*, 2014; Real *et al.*, 2014). These features make PLS-SEM suitable for research focusing on theoretical exploration of relationships also with small sample sizes (Ahammad *et al.*, 2017; Real *et al.*, 2014). The “ten-times rule” is widely used for the sample size in the PLS-SEM. This means that the minimum count of observations is ten times the maximum number of

paths directing to the particular latent construct in the structural model (Hair *et al.*, 2011). For our models, this requirement is met as there are six paths, i.e. minimum sample size being 60 while our sample size is 96; therefore, the sample size fits the requirements for running a PLS-SEM with the current set of variables.

4.2 Descriptive statistics

Table 2 presents the means and standard deviations and provides a correlation matrix for the variables. As the matrix shows, there are significant correlations between the independent variable (renewal capital), the moderating variable (knowledge protection) and the dependent variables (incremental and radical innovativeness). This supports interconnectedness between the constructs of interest.

4.3 Measurement models

To test the measurement models, we assessed the internal consistency and the discriminant validity. During this phase, we removed one item from the knowledge protection and one item from the radical innovation performance because of low and insignificant factor loadings.

4.4 Internal consistency

Measures of construct reliability (CR) and convergent validity represent the internal consistency. According to the CR test, all the constructs showed a value above the threshold (0.7, adopted by Bagozzi and Yi, 1991; see Table 1). To test for convergent validity, we examined CR, the factor loading and average variance extracted (AVE). First, the loadings of all the items included in the final models were high and statistically significant, which means that they were all related to their specific constructs, verifying the posited relationships among the indicators and constructs. Second, the AVE measure exceeded the cut-off (0.50; see Fornell and Larcker, 1981) in all our constructs.

4.5 Discriminant validity and multicollinearity

Discriminant validity indicates the extent to which any one construct differs from the others. To assess it, we first tested if the AVEs are greater than the variance shared between that construct and the other constructs in the model (i.e. the squared correlation between two constructs; Fornell and Larcker, 1981; Hair *et al.*, 2020). The constructs of our study fulfill this condition and the AVEs for all the constructs are greater than the squared correlations.

Second, we tested discriminant validity by means of heterotrait–monotrait ratio (HTMT) following the procedure suggested by Hair *et al.* (2017, 2020; see also Henseler *et al.*, 2016). The results showed that the HTMT values for all pairs of constructs were under the threshold value of 0.90. Moreover, based on a computed bootstrapping procedure, all

Table 2 Correlation matrix

Variable	*Mean*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*
1. Employees	346.59	459.68						
2. Industry (Manufacturing)	–	–	−0.01					
3. R&D intensity	0.15	2.52	0.86	0.276*				
4. Renewal capital	3.50	0.66	0.055	−0.182	0.172			
5. Knowledge protection	4.11	0.96	0.150	0.048	−0.011	0.329**		
6. Incremental innovation performance	4.79	0.84	−0.038	0.009	0.026	0.217*	0.215*	
7. Radical innovation performance	4.35	0.94	−0.121	0.014	0.023	0.270*	0.181	0.555**

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

HTMT values were significantly different from 1. These results support the discriminant validity of the studied constructs.

Finally, we tested collinearity between the constructs using the variance inflation factor (VIF) as a metric for multicollinearity. The VIF should not exceed a value of 5 (Henseler *et al.*, 2016; Hair *et al.*, 2017) and the constructs of our studies fulfilled this condition. The highest value was for the renewal capital: in the incremental innovation (1.260) and in the radical innovation (1.210) model.

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

4.6 Testing the research model

To test our hypothesis, we estimated path models reflecting the posited relationships between renewal capital, knowledge protection and innovation performance. This was done separately for incremental and radical innovation performance, i.e. models for both types of innovation performance were tested singly. As shown in Table 3, our research models could explain 13% of the variance of the incremental and 11% for the radical innovation performance of the firm. Thus, the coefficient of determination for both is at adequate level taking into consideration that the dependent variable (here innovation performance) is affected by a host of other factors in addition to the ones considered in the analyses (Hair *et al.*, 2017). Moreover, to test explanatory power of our models further, we evaluated predictive relevance of the models as suggested in the literature (Hair *et al.*, 2017). Values for Q^2 (see Table 3) are above zero, showing a satisfactory predictive relevance for innovation performance.

The results provided support for most of our hypothesis (see Table 3 and Figure 2). First, as suggested in *H1* and *H2*, renewal capital has a direct and positive effect on both incremental ($B = 0.231$, $p = 0.023$) and radical ($B = 0.247$, $p = 0.018$) innovation performance of the firm. In addition, we hypothesized that knowledge protection will negatively moderate the relationship between renewal capital and innovation performance of the firm. Only *H3* was supported: knowledge protection works as a negative moderator on the relationship between renewal capital and incremental innovation performance, by weakening the effect ($B = -0.229$, $p = 0.030$). See also Figure 3 for a graphical interpretation of this moderation effect. *H4* gets only modest support, and coupled with a much weaker effect, we conclude that *H4* is not statistically supported, albeit the effect is realized to the expected direction. Finally, while we did not hypothesize a direct effect for knowledge protection, we still included it in the analysis. The results show that knowledge protection has a slightly positive association with both incremental and radical innovation, but this association is not statistically significant.

4.7 Post hoc tests

In addition to testing our research models, we wanted to both show robustness of our results and explore the relationships between renewal capital, knowledge protection and innovation performance in more detail. Thus, we performed several post hoc tests by testing additional models.

4.8 Sub-group analyses: knowledge protection

First, we conducted a sub-group analysis to check the robustness of our results. For this purpose, we did a median split to divide companies into sub-samples based on how strongly they use knowledge protection (i.e. one-item measure that was used in the analysis above). After the split, we got groups for companies with low (sample size 54, mean = 3,48, SD = 0.771) and high (sample size 38, mean = 5, SD = 0) knowledge protection. Then we tested the direct effect of renewal capital to innovation performance with these subgroups. For radical innovation performance, the direct effect for the companies with low knowledge protection ($B = 0.290$,

Table 3 Direct and moderation effects on innovation performances to test the hypotheses

	Incremental innovation performance (n = 96)						*Radical innovation performance (n = 96)*					
	Model A: control variables		*Model B: control variables and direct effects*		*Model C: control variables, direct effects and moderation effect*		*Model A: control variables*		*Model B: control variables and direct effects*		*Model C: control variables, direct effects and moderation effect*	
Variable	*B (t-value)*	*p-value*	*B (t-value)*	*p-value*	*B (t-value)*	*p-value*	*B (t-value)*	*p-value*	*B (t-value)*	*p-value*	*B (t-value)*	*p-value*
Control variables												
Employees	0.067 (0.682)	0.248 (ns)	−0.081 (1.071)	0.142 (ns)	−0.070 (0.953)	0.170 (ns)	−0.110 (1.334)	0.091 (ns)	−0.136 (1.636)	0.051 (ns)	−0.133 (1.600)	0.055 (ns)
Industry (Manufacturing)	0.159 (0.923)	0.178 (ns)	0.028 (0.250)	0.401 (ns)	0.035 (0.307)	0.379 (ns)	−0.007 (0.054)	0.479 (ns)	0.033 (0.307)	0.379 (ns)	0.038 (0.347)	0.364 (ns)
R&D intensity	0.170 (0.917)	0.179 (ns)	−0.041 (0.291)	0.385 (ns)	−0.005 (0.033)	0.487 (ns)	0.048 (0.323)	0.373 (ns)	−0.009 (0.078)	0.469 (ns)	0.014 (0.124)	0.451 (ns)
Direct effect												
Renewal capital			0.214 (1.838)	0.033*	0.231 (2.002)	0.023*			0.237 (2.173)	0.015*	0.247 (2.098)	0.018*
Knowledge protection			0.153 (1.438)	0.075 (ns)	0.134 (1.303)	0.096 (ns)			0.112 (0.947)	0.172 (ns)	0.106 (0.890)	0.187 (ns)
Moderation effect												
Renewal capital × Knowledge protection					−0.229 (1.888)	0.030*					−0.133 (1.600)	0.055 (ns)
R^2	0.08		0.09		0.13		0.01		0.09		0.11	
Q^2	0.03		0.03		0.04		0.02		0.03		0.03	

Notes: All *p*-values are one-tailed; ns: not statistically significant; *statistically significant at the level of $p < 0.05$

Figure 2 Results (control variables are omitted for clarity reasons)

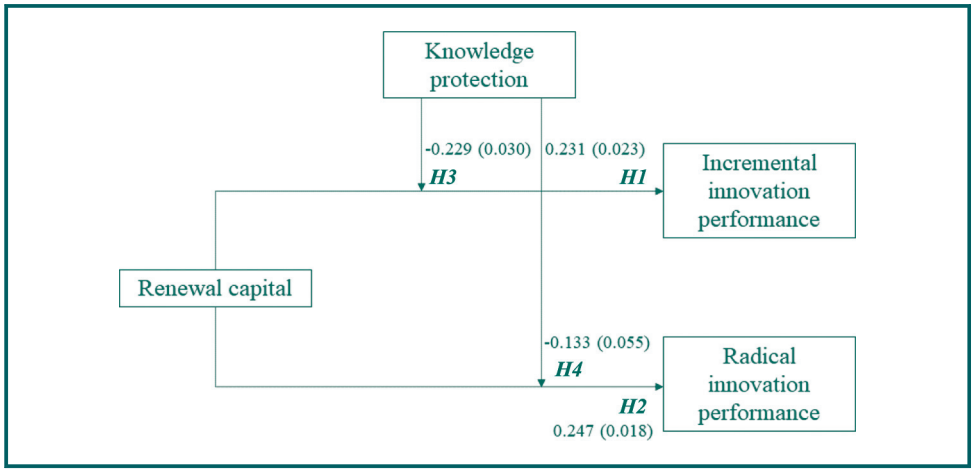
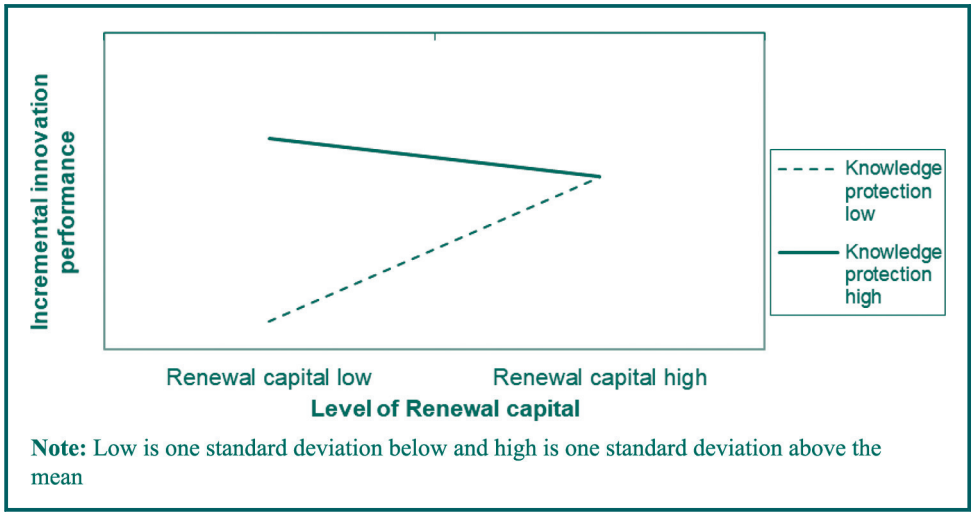


Figure 3 A graphical interpretation of moderation effect in incremental innovation performance model



Note: Low is one standard deviation below and high is one standard deviation above the mean

p = 0.043) was positive and statistically significant. Meanwhile, the same direct effect for the companies with the high knowledge protection was not significant (B = 0.182, p = 0.275). The effect of knowledge protection was even more evident in the case of incremental innovation: the effect of renewal capital on incremental innovation in the low knowledge protection subgroup was positive (B = 0.327, p = 0.007), whereas within the high knowledge protection group, the effect was negative, even if not statistically supported (B = −0.276, p = 0.222). Altogether, the results from the sub-group analyses give additional support for the results presented above, even if because of the small sample size, there were no statistical significance for the coefficients concerning the sub-group with high knowledge protection.

4.9 Sub-group analyses: control variables

Next, we compared companies with low and high R&D intensity as well as smaller and larger companies (operationalized as number of employees). For that we performed a

median split to divide companies into sub-samples. Based on a median split (median = 1.10), we got groups for companies with low (sample size: 41, mean = −1.71, SD = 2.37) and high (sample size: 43, mean = 1.94, SD = 0.75) R&D intensity, as well as groups (median = 204) for smaller (sample size: 46, mean = 140.02, SD = 31.44) and larger (sample size: 45, mean = 557.76, SD = 583.94) companies.

The results for the R&D intensity showed that regarding the incremental innovation performance, the moderation effect of knowledge protection was significant with approximately same effect size within companies with both high (B = −0.363, p = 0.043) and low (B = −0.385, p = 0.032) R&D intensity. The results regarding the radical innovation performance gave some interesting insights. The direct effect of renewal capital was significant only within the companies with high R&D intensity (B = 0.380, p = 0.016). For the companies with low R&D intensity, the direct effect was to the opposite direction (even though not statistically significant): B = −0.283, p = 0.242. The results regarding the moderating effect of knowledge protection were parallel in both sub-samples being negative for the companies with low (B = −0.133, p = 0.313) as well as for the companies with high (B = −0.123, p = 0.239) R&D intensity.

Regarding the size of the company, the results showed that both direct effect of renewal capital and the moderating effect of knowledge protection to incremental innovation performance varied. The effect size for the direct effect of renewal capital within the smaller companies was 0.342 (p = 0.058) compared with larger companies (B = 0.147, p = 0.242). Regarding the moderating effect, the results were contrary: for smaller companies, B = −0.203 (p = 0.181) and for larger companies, B = −0.306 (p = 0.047). Results for the radical innovation performance followed the same pattern. The direct effect of renewal capital was greater among smaller companies (B = 0.362, p = 0.028) compared with larger ones (B = 0.179, p = 0.250). However, in the size of the moderation effect, there were no major differences between smaller (B = −0.125, p = 0.271) and larger (B = −0.162, p = 0.185) companies. In summary, the conclusion of the sub-group analysis of the firm size demonstrates that the size of the firm is an important driver behind the explanatory mechanism of *H1* and *H2*. Smaller firms tend to benefit more from renewal capital for both incremental and radical innovation performance. This might relate to the relatively more important role of employees' learning efforts in smaller firms, while in larger firms there might be more structured ways to renew the firm's knowledge base (e.g. corporate education programs, internal trainings). Regarding *H3* and *H4*, we would be less careful in interpreting the role of company size, given the relatively smaller differences in effect sizes.

4.10 Additional operationalization of knowledge protection

As described in Section 3.2, we decided to use a one-item measure for the knowledge protection. However, we performed additional tests with different operationalizations of knowledge protection to analyse more deeply its moderating role in the relationship between renewal capital and innovation performance. For this, we used two one-item measures, i.e. one covering *formal* and one *informal* protection. The results for the formal protection showed that there was no statistically significant moderation effect of knowledge protection in incremental (B = −0.161, p = 0.083) or in radical (B = −0.073, p = 0.270) innovation performance models. This was the case also regarding informal protection: incremental (B = −0.023, p = 0.436) and radical (B = −0.012, p = 0.468) innovation performance. Thus, it seems that the overall, general protection for knowledge is the most harmful form of protection in the relationship between renewal capital and innovation performance.

5. Discussion and implications

Overall, our results provide more understanding how firms deal with both creative and closed approaches as it comes to managing IC for innovation purposes. The results

strongly support that renewal capital is positively associated with both incremental and radical innovation performance. However, a combination of strong renewal capital and knowledge protection is harmful especially for incremental innovation. Here, the results imply that for incremental innovation, there is a strategic contradiction where firms cannot simultaneously have "all of the good things": to renew themselves and acquire knowledge from external environment, while at the same time securing as much knowledge as possible within their boundaries. The reason for this negative effect might be related to the suppressive role of knowledge protection; the firm's representatives might miss out opportunities to learn and renew their knowledge base given their need to protect knowledge from different stakeholders. Because learning ultimately requires knowledge sharing and transfer (Tranekjer and Knudsen, 2012; Caimo and Lomi, 2015; Loebbecke *et al.*, 2016), firms with a protective approach might miss out those opportunities. Furthermore, the interaction effect between renewal capital and knowledge protection on radical innovation was not statistically significant. This suggests that there is a difference for renewal-oriented firms that aim to protect their knowledge for incremental and radical innovation domains. One way to interpret this differing result relates to the more proprietary nature of radically new knowledge: the more novel and radical the knowledge, the more important is its protection for the focal firm given that such innovations have a potentially major effect on the markets and technologies where the firm operates (Garcia and Calantone, 2002). Therefore, firms might particularly suffer from leakages of radical-innovation-related knowledge (Li *et al.*, 2008; Ritala *et al.*, 2018). This leads to a conclusion that knowledge protection (in combination with a renewal approach) might be relatively more relevant for firms aiming for radical than incremental innovation. However, this interpretation should be treated with caution, and more studies are needed to pin down to the differences between incremental and radical innovation in the context of our arguments. Finally, our results also demonstrated that knowledge protection has a slightly positive association with both incremental and radical innovation, but this association was not statistically significant. In summary, our results point out to an overall finding that both renewal capital and knowledge protection might be beneficial for firm's innovation performance, but that there is a negative synergy. In other words, on average, firms will struggle if they try to combine a strong learning and renewal orientation with a protective approach to knowledge.

Our findings contribute to several streams of literature. These contributions provide implications and also open areas for further inquiry. First, we contribute to the literature that has proposed renewal capital as an essential facet of the overall IC of the firm (Edvinsson and Malone, 1997), particularly for innovation-oriented companies. With the time-lagged research design, our study provides strong empirical support for the claims made in organizational renewal capability and renewal capital research (Kianto, 2007; Kianto *et al*, 2010; Inkinen *et al.*, 2017) as well as dynamic capabilities literature (Teece *et al.*, 1997). In particular, our findings empirically confirm the expectation that renewal and learning attempts lead – over time – to improved incremental and radical innovation performance. Hence, the results provide backing for the recent claims concerning the importance of acknowledging the renewal aspect in the IC framework (Mention and Bontis, 2013; Buenechea-Elberdin *et al.*, 2017; Cabrilo and Dahms, 2020). This means that IC literature should consider incorporating an explicitly renewal-focused element in the bundle of intangible value-generating issues that are examined. While the typical three-partite categorization of IC elements includes human, structural and relational components, complementing these with the extent to which organizational knowledge is renewed and modified should provide an important addition for understanding innovation-oriented firms (Rehman *et al.*, 2021). Related future research issues include interrelations of the more static and dynamic IC components, as well as how such interrelations impact, for

example, exploitative and explorative innovation activities in various types of institutional contexts.

Second, we contribute to the literature examining the role of appropriability and related knowledge protection mechanisms on innovation performance of the firm (Teece, 1986; Ritala and Hurmelinna-Laukkanen, 2013; James *et al.*, 2013). In this regard, our study provides interesting results that provide understanding of the "dark side" of knowledge protection. We find support for claims that overemphasis on knowledge protection might become harmful especially for those organizations that are renewal oriented, especially in terms of pursuit of incremental innovations. For radical innovation, the knowledge protection is likely to have particular benefits for profiting from radical innovation because such innovation can lose its value when exposed widely (Li *et al.*, 2008). This aspect might partially accommodate the potential downsides of protectiveness. While we examined knowledge protection as an overall organizational approach, further studies could go deeper in distinguishing between formal and informal mechanisms (Zobel *et al.*, 2017) and their downsides to firm's innovation efforts. Furthermore, while we treated knowledge protection as a moderator in the current study, future studies could also examine the direct effects of knowledge protection to different types of innovation performance. Our findings of the slightly positive (but not statistically significant) role of knowledge protection supports the assumption that knowledge protection could play a useful role in innovation performance, especially if firms can focus on protecting their core knowledge, while still being able to disclose relevant knowledge to boost collaboration, knowledge sharing and interaction within and across firm's boundaries (see also Ritala and Stefan, 2021).

Finally, our paper contributes to the studies examining paradoxical tensions in organizations (Smith and Lewis, 2011). Protecting knowledge while pursuing dynamism constitutes a paradoxical tension that has been recognized in both intra-organizational literature (Husted and Michailova, 2002) and inter-organizational literature (Bogers, 2011; Gast *et al.*, 2019). Our results complement and support such findings in showing that incremental innovation can be hampered by overly protective approach; in this case, renewal-oriented firms are not likely to get access to reciprocal knowledge sharing among their industrial peers, leading to lower potential of knowledge combinations. For radical innovation, the protective approach against competitors and other stakeholders within which knowledge is not supposed to leak (as empirically operationalized in our survey) might have specific benefits that balance out the challenges with more open approaches. It is important to further note that knowledge protection issues can emerge in any collaboration, and in open innovation strategies in general (see Laursen and Salter, 2014; Ritala and Stefan, 2021). This notion calls out for further studies to examine how firms can deal with knowledge protection-related tensions with different stakeholders, including competitors, suppliers, customers, consultants and internal stakeholders.

Managers and practitioners could benefit from our findings. It is healthy to recognize that it is difficult to "have it both ways" when dealing with knowledge: to both protect and to enlarge the firm's knowledge base. Our findings demonstrate that firms that are strongly oriented to learn and renew their knowledge base will suffer from strong knowledge protection approach, especially as it comes to incremental innovation. Being protective has concrete consequences; there will be corporate policies to with whom to share, what to share and what not to disclose. Furthermore, non-disclosure agreements and other formal measures might come to play, which further suppresses different interactions and opportunities to learn. However, while difficult, firms should consider using different ways to simultaneously secure the proprietary knowledge, while at the same time enabling their employees to engage with learning and knowledge-sharing opportunities, both internally and externally. Some of the known approaches for this include "selective revealing," which refers to disclosing some aspects of knowledge to engage into collaborations and interactions, while securing

some other aspects within the firm (Alexy *et al.*, 2013). Other scholars have suggested that patents and other formal intellectual property (IP) mechanisms might enable firms to share knowledge more widely, as the core knowledge is explicitly protected via the IP mechanism (Ritala and Hurmelinna-Laukkanen, 2013). However, not all (or most) knowledge is patentable. In the end, firms need to think carefully – and sometimes case-by-case – their approach to knowledge disclosure, protection and learning.

As any, also this study has some limitations. First, for the innovation performance, we use subjective assessments. Even if the time-lagged research design, as well as the wording of the measure, helps to eliminate some of the challenges in this approach, future studies could find alternative ways to operationalize and measure innovation performance. For example, in the future studies, objective measures for the innovation performance together with the different respondents for the renewal capital and knowledge protection could be used. Second, due the research design and our attempt to cover longitudinal nature of the causal relationship of renewal capital and knowledge protection on innovation performance, the sample size is fairly modest (n = 96, based on the cross section of two 200+ survey samples). To apply more sophisticated methods of analyses (e.g. traditional covariance-based SEM), one should strive for larger number of respondents. Third, and as indicated in Section 3, we rely on informants' self-assessment of the stakeholders that the knowledge is protected from. This approach is necessarily limited, as it does not uncover the amount of knowledge flows that take place and where, nor the focus of the protection (e.g. internal or external stakeholders). While these questions are outside of the scope of the current study, we believe that other studies could focus more closely on the dynamics of internal and external knowledge spillovers, the consequences of those and how knowledge protection affects those dynamics. Finally, this study has been conducted in Finland, and among firms with at least 100 employees. While we expect the results to be sufficiently generalizable to other Nordic countries and European context more broadly, the obvious limitation is that innovation activities are always bound to institutional and regulative contexts. To show generalizability of the results and to overcome possible peculiarities of one single country, it could be worthwhile to conduct similar studies in other countries with different kind of cultural and institutional backgrounds.

References

Ahammad, M.F., Tarba, S.Y., Frynas, J.G. and Scola, A. (2017), "Integration of non-market and market activities in cross-border mergers and acquisitions", *British Journal of Management*, Vol. 28 No. 4, pp. 629-648.

Alexy, O., George, G. and Salter, A.J. (2013), "Cui bono? The selective revealing of knowledge and its implications for innovative activity", *Academy of Management Review*, Vol. 38 No. 2, pp. 270-291.

Ali, M., Shujahat, M., Ali, Z., Kianto, A., Wang, M. and Bontis, N. (2022), "The neglected role of knowledge assets interplay in the pursuit of organisational ambidexterity", *Technovation*, Vol. 114, p. 102452.

Bagozzi, R.P. and Yi, Y. (1991), "Multitrait-multimethod matrices in consumer research", *Journal of Consumer Research*, Vol. 17 No. 4, pp. 426-439.

Baron, R.M. and Kenny, D.A. (1986), "The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations", *Journal of Personality and Social Psychology*, Vol. 51 No. 6, pp. 1173-1182.

Bessant, J., Öberg, C. and Trifilova, A. (2014), "Framing problems in radical innovation", *Industrial Marketing Management*, Vol. 43 No. 8, pp. 1284-1292.

Bogers, M. (2011), "The open innovation paradox: knowledge sharing and protection in R&D collaborations", *European Journal of Innovation Management*, Vol. 14 No. 1, pp. 93-117.

Buenechea-Elberdin, M. (2017), "Structured literature review about intellectual capital and innovation", *Journal of Intellectual Capital*, Vol. 18 No. 2, pp. 262-285.

Buenechea-Elberdin, M., Sáenz, J. and Kianto, A. (2017), "Exploring the role of human capital, renewal capital and entrepreneurial capital in innovation performance in high-tech and low-tech firms", *Knowledge Management Research & Practice*, Vol. 15 No. 3, pp. 369-379.

Cabrilo, S. and Dahms, S. (2018), "How strategic knowledge management drives intellectual capital to superior innovation and market performance", *Journal of Knowledge Management*, Vol. 22 No. 3, pp. 621-648.

Cabrilo, S. and Dahms, S. (2020), "The role of multidimensional intellectual capital and organizational learning practices in innovation performance", *European Management Review*, Vol. 17 No. 4, pp. 835-855.

Cabrilo, S., Kianto, A. and Misic, B. (2018), "The effect of IC components on innovation performance in Serbian companies", *VINE Journal of Information and Knowledge Management Systems*, Vol. 48 No. 3, pp. 448-466.

Caimo, A. and Lomi, A. (2015), "Knowledge sharing in organizations: a bayesian analysis of the role of Reciprocity and Formal Structure", *Journal of Management*, Vol. 41 No. 2, pp. 665-691.

Cappa, F., Oriani, R., Peruffo, E. and McCarthy, I. (2021), "Big data for creating and capturing value in the digitalized environment: unpacking the effects of volume, variety, and veracity on firm performance", *Journal of Product Innovation Management*, Vol. 38 No. 1, pp. 49-67.

Carnabuci, G. and Operti, E. (2013), "Where do firms' recombinant capabilities come from? Intraorganizational networks, knowledge, and firms' ability to innovate through technological recombination", *Strategic Management Journal*, Vol. 34 No. 13, pp. 1591-1613.

Cesaroni, F.M., Del Baldo, M., Demartini, P. and Paoloni, P. (2015), "Entrepreneurial, renewal and trust capital of Italian firms: insights from an empirical study", *International Journal of Management, Knowledge and Learning*, Vol. 4 No. 1, pp. 69-89.

Chen, J., Zhu, Z. and Yuan Xie, H. (2004), "Measuring intellectual capital: a new model and empirical study", *Journal of Intellectual Capital*, Vol. 5 No. 1, pp. 195-212.

Chesbrough, H., Lettl, C. and Ritter, T. (2018), "Value creation and value capture in open innovation", *Journal of Product Innovation Management*, Vol. 35 No. 6, pp. 930-938.

Cohen, W.M. and Levinthal, D.A. (1990), "Absorptive capacity: a new perspective on learning and innovation", *Administrative Science Quarterly*, Vol. 35 No. 1, pp. 128-152.

Crossan, M.M., Lane, H.W. and White, R.E. (1999), "An organizational learning framework: from intuition to institution", *The Academy of Management Review*, Vol. 24 No. 3, pp. 522-537.

Damanpour, F. (1991), "Organizational innovation: a meta-analysis of effects of determinants and moderators", *Academy of Management Journal*, Vol. 34 No. 3, pp. 555-590.

Edvinsson, L. and Malone, M. (1997), *Intellectual Capital: Realising Your Company's True Value by Finding Its Hidden Brainpower*, Harper Collins, New York, NY.

Estrada, I., Faems, D. and de Faria, P. (2016), "Coopetition and product innovation performance: the role of internal knowledge sharing mechanisms and formal knowledge protection mechanisms", *Industrial Marketing Management*, Vol. 53, pp. 56-65.

Fernandez, A.S. and Chiambaretto, P. (2016), "Managing tensions related to information in coopetition", *Industrial Marketing Management*, Vol. 53, pp. 66-76.

Fleming, L. (2001), "Recombinant uncertainty in technological search", *Management Science*, Vol. 47 No. 1, pp. 117-132.

Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.

Garcia, R. and Calantone, R. (2002), "A critical look at technological innovation typology and innovativeness terminology: a literature review", *Journal of Product Innovation Management*, Vol. 19 No. 2, pp. 110-132.

Gast, J., Gundolf, K., Harms, R. and Collado, E.M. (2019), "Knowledge management and coopetition: how do cooperating competitors balance the needs to share and protect their knowledge?", *Industrial Marketing Management*, Vol. 77, pp. 65-74.

Grant, R. (1996), "Toward a knowledge-based theory of the firm", *Strategic Management Journal*, Vol. 17 No. S2, pp. 109-122.

Hair, J.F., Howard, M.C. and Nitzl, C. (2020), "Assessing measurement model quality in PLS-SEM using confirmatory composite analysis", *Journal of Business Research*, Vol. 109, pp. 101-110.

Hair, J.F., Hult, G.M., Ringle, C. and Sarstedt, M. (2017), *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, 2nd ed., Sage Publications, Thousand Oaks, CA.

Hair, J.F., Ringle, C.M. and Sarstedt, M. (2011), "PLS-SEM: indeed a silver bullet", *Journal of Marketing Theory and Practice*, Vol. 19 No. 2, pp. 139-152.

Hair, J.F., Sarstedt, M., Hopkins, L. and Kuppelwieser, V.G. (2014), "Partial least squares structural equation modeling (PLS-SEM) – an emerging tool in business research", *European Business Review*, Vol. 26 No. 2, pp. 106-121.

Henseler, J., Hubona, G. and Ash Ray, P. (2016), "Using PLS path modeling in new technology research: updated guidelines", *Industrial Management & Data Systems*, Vol. 116 No. 1, pp. 2-20.

Henttonen, K., Hurmelinna-Laukkanen, P. and Ritala, P. (2016), "Managing the appropriability of R&D collaboration", *R&D Management*, Vol. 46 No. S1, pp. 145-158.

Hsu, Y.H. and Fang, W. (2009), "Intellectual capital and new product development performance: the mediating role of organizational learning capability", *Technological Forecasting and Social Change*, Vol. 76 No. 5, pp. 664-677.

Hurley, R.F. and Hult, G.T.M. (1998), "Innovation, market orientation, and organizational learning: an integration and empirical examination", *Journal of Marketing*, Vol. 62 No. 3, pp. 42-54.

Hurmelinna-Laukkanen, P., Sainio, L.M. and Jauhiainen, T. (2009), "Appropriability regime for radical and incremental innovations", *R&D Management*, Vol. 38 No. 3, pp. 278-289.

Hussinki, H., Kianto, A., Vanhala, M. and Ritala, P. (2017), "Assessing the universality of knowledge management practices", *Journal of Knowledge Management*, Vol. 21 No. 6, pp. 1596-1621.

Husted, K. and Michailova, S. (2002), "Diagnosing and fighting knowledge-sharing hostility", *Organizational Dynamics*, Vol. 31 No. 1, pp. 60-73.

Inkinen, H., Kianto, A., Vanhala, M. and Ritala, P. (2017), "Structure of intellectual capital – an international comparison", *Accounting, Auditing & Accountability Journal*, Vol. 30 No. 5, pp. 1160-1183.

James, S.D., Leiblein, M.J. and Lu, S. (2013), "How firms capture value from their innovations", *Journal of Management*, Vol. 39 No. 5, pp. 1123-1155.

Jiang, X., Bao, Y., Xie, Y. and Gao, S. (2016), "Partner trustworthiness, knowledge flow in strategic alliances and firm competitiveness: a contingency perspective", *Journal of Business Research*, Vol. 69 No. 2, pp. 804-814.

Jimenez-Jimenez, D., Sanz-Valle, R. and Hernandez-Espallardo, M. (2008), "Fostering innovation: the role of market orientation and organizational learning", *European Journal of Innovation Management*, Vol. 11 No. 3, pp. 389-412.

Kang, S.C. and Snell, S.A. (2009), "Intellectual capital architectures and ambidextrous learning: a framework for human resource management", *Journal of Management Studies*, Vol. 46 No. 1, pp. 65-92.

Ketokivi, M.A. and Schroeder, R.G. (2004), "Perceptual measures of performance: fact or fiction?", *Journal of Operations Management*, Vol. 22 No. 3, pp. 247-264.

Kianto, A. (2007), "What do we really mean by the dynamic dimension of intellectual capital?", *International Journal of Learning and Intellectual Capital*, Vol. 4 No. 4, pp. 342-356.

Kianto, A., Hurmelinna-Laukkanen, P. and Ritala, P. (2010), "Intellectual capital in service-and product-oriented companies", *Journal of Intellectual Capital*, Vol. 11 No. 3, pp. 305-325.

Lane, P., Koka, B. and Pathak, S. (2006), "The reification of absorptive capacity: a critical review and rejuvenation of the construct", *Academy of Management Review*, Vol. 31 No. 4, pp. 833-863.

Laursen, K. and Salter, A.J. (2014), "The paradox of openness: appropriability, external search and collaboration", *Research Policy*, Vol. 43 No. 5, pp. 867-878.

Leonard-Barton, D. (1995), "Wellsprings of knowledge", *Building and Sustaining the Sources of Innovation*, Harvard Business School Press, Boston, MA.

Lewin, A., Massini, S. and Peeters, C. (2011), "Microfoundations of internal and external absorptive capacity routines", *Organization Science*, Vol. 22 No. 1, pp. 81-98.

Li, D., Eden, L., Hitt, M.A. and Ireland, R.D. (2008), "Friends, acquaintances, or strangers? Partner selection in R&D alliances", *Academy of Management Journal*, Vol. 51 No. 2, pp. 315-334.

Liang, H., Saraf, N., Hu, Q. and Zue, Y. (2008), "Assimilation of enterprise systems: the effect of institutional pressures and the mediating role of top management", *MIS Quarterly*, Vol. 31 No. 1, pp. 59-87.

Liebeskind, J.P. (1996), "Knowledge, strategy, and the theory of the firm", *Strategic Management Journal*, Vol. 17 No. S2, pp. 93-107.

Loebbecke, C., van Fenema, P.C. and Powell, P. (2016), "Managing inter-organizational knowledge sharing", *The Journal of Strategic Information Systems*, Vol. 25 No. 1, pp. 4-14.

MacKenzie, S.B. and Podsakoff, P.M. (2012), "Common method bias in marketing: causes, mechanisms, and procedural remedies", *Journal of Retailing*, Vol. 88 No. 4, pp. 542-555.

Maditinos, D., Sevic, Z. and Tsairidis, C. (2010), "Intellectual capital and business performance: an empirical study for the Greek listed companies", *European Research Studies Journal*, Vol. 13 No. 3, pp. 145-167.

Mahmood, T. and Mubarik, M.S. (2020), "Balancing innovation and exploitation in the fourth industrial revolution: role of intellectual capital and technology absorptive capacity", *Technological Forecasting and Social Change*, Vol. 160, p. 120248.

Manhart, M. and Thalmann, S. (2015), "Protecting organizational knowledge: a structured literature review", *Journal of Knowledge Management*, Vol. 19 No. 2, pp. 190-211.

March, J. (1991), "Exploration and exploitation in organizational learning", *Organization Science*, Vol. 2 No. 1, pp. 71-87.

Mention, A.-L. and Bontis, N. (2013), "Intellectual capital and performance within the banking sector of Luxembourg and Belgium", *Journal of Intellectual Capital*, Vol. 14 No. 2, pp. 286-309.

Miller, W. (1999), "Building the ultimate resource", *Management Review*, Vol. 88 No. 1, pp. 42-45.

Minbaeva, D., Mäkelä, K. and Rabbiosi, L. (2012), "Linking HRM and knowledge transfer via individual-level mechanisms", *Human Resource Management*, Vol. 51 No. 3, pp. 387-405.

Nahapiet, J. and Ghoshal, S. (1998), "Social capital, intellectual capital, and the organizational advantage", *The Academy of Management Review*, Vol. 23 No. 2, pp. 242-266.

Nazari, J.A. and Herremans, I.M. (2007), "Extended VAIC model: measuring intellectual capital components", *Journal of Intellectual Capital*, Vol. 8 No. 4, pp. 595-609.

Nieto, M.J. and Santamaría, L. (2007), The importance of diverse collaborative networks for the novelty of product innovation, *Technovation*, Vol. 27 Nos 6/7, pp. 367-377.

Nonaka, I. and Takeuchi, H. (1995), *The Knowledge-Creating Company*, Oxford University Press, New York, NY.

Paoloni, M., Coluccia, D., Fontana, S. and Solimene, S. (2020), "Knowledge management, intellectual capital and entrepreneurship: a structured literature review", *Journal of Knowledge Management*, Vol. 24 No. 8, pp. 1797-1818.

Perry-Smith, J.E. (2006), "Social yet creative: the role of social relationships in facilitating individual creativity", *Academy of Management Journal*, Vol. 49 No. 1, pp. 85-101.

Pinnington, B., Lyons, A. and Meehan, J. (2021), "Value-independent third-party orchestrators as catalysts of business collaboration", *Journal of Management Inquiry*, Vol. 30 No. 4, pp. 438-453.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y. and Podsakoff, N.P. (2003), "Common method biases in behavioral research: a critical review of the literature and recommended remedies", *Journal of Applied Psychology*, Vol. 88 No. 5, pp. 879-903.

Polanyi, M. (1966/1990), *The Tacit Dimension*, University of Chicago Press. Chicago.

Ray, G., Barney, J.B. and Muhanna, W.A. (2004), "Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource-based view", *Strategic Management Journal*, Vol. 25 No. 1, pp. 23-37.

Real, J.C., Roldán, J.L. and Leal, A. (2014), "From entrepreneurial orientation and learning orientation to business performance: analysing the mediating role of organizational learning and the moderating effects of organizational size", *British Journal of Management*, Vol. 25 No. 2, pp. 186-208.

Reed, K.K., Lubatkin, M. and Srinivasan, N. (2006), "Proposing and testing an intellectual capital-based view of the firm", *Journal of Management Studies*, Vol. 43 No. 4, pp. 867-893.

Rehman, S.U., Elrehail, H., Alsaad, A. and Bhatti, A. (2021), "Intellectual capital and innovative performance: a mediation-moderation perspective", *Journal of Intellectual Capital*, Vol. 23 No. 5, pp. 998-1024.

Rindfleisch, A., Malter, A., Ganesan, S. and Moorman, C. (2008), "Cross-sectional versus longitudinal survey research: concepts, findings, and guidelines", *Journal of Marketing Research*, Vol. 45 No. 3, pp. 261-279.

Ringle, C.M., Wende, S. and Becker, J. (2015), *SmartPLS 3*, SmartPLS GmbH, Boenningstedt.

Ritala, P. and Hurmelinna-Laukkanen, P. (2013), "Incremental and radical innovation in coopetition – the role of absorptive capacity and appropriability", *Journal of Product Innovation Management*, Vol. 30 No. 1, pp. 154-169.

Ritala, P., Husted, K., Olander, H. and Michailova, S. (2018), "External knowledge sharing and radical innovation: the downsides of uncontrolled openness", *Journal of Knowledge Management*, Vol. 22 No. 5, pp. 1104-1123.

Ritala, P., Olander, H., Michailova, S. and Husted, K. (2015), "Knowledge sharing, knowledge leaking and relative innovation performance: an empirical study", *Technovation*, Vol. 35, pp. 22-31.

Ritala, P. and Stefan, I. (2021), "A paradox within the paradox of openness: the knowledge leveraging conundrum in open innovation", *Industrial Marketing Management*, Vol. 93, pp. 281-292.

Sanz-Valle, R., Naranjo-Valencia, J.C., Jimenez-Jimenez, D. and Perez-Caballero, L. (2011), "Linking organizational learning with technical innovation and organizational culture", *Journal of Knowledge Management*, Vol. 15 No. 6, pp. 997-1015.

Savino, T., Messeni Petruzzelli, A. and Albino, V. (2017), "Search and recombination process to innovate: a review of the empirical evidence and a research agenda", *International Journal of Management Reviews*, Vol. 19 No. 1, pp. 54-75.

Smith, W.K. and Lewis, M.W. (2011), "Toward a theory of paradox: a dynamic equilibrium model of organizing", *Academy of Management Review*, Vol. 36 No. 2, pp. 381-403.

Subramaniam, M. and Youndt, M.A. (2005), "The influence of intellectual capital on the types of innovative capabilities", *Academy of Management Journal*, Vol. 48 No. 3, pp. 450-463.

Taylor, A. and Greve, H. (2006), "Superman or the fantastic four? Knowledge combination and experience in innovative teams", *Academy of Management Journal*, Vol. 49 No. 4, pp. 723-740.

Teece, D.J. (1986), "Profiting from technological innovation: implications for integration, collaboration, licensing and public policy", *Research Policy*, Vol. 15 No. 6, pp. 285-305.

Teece, D.J., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Journal*, Vol. 18 No. 7, pp. 509-533.

Thomä, J. and Bizer, K. (2013), "To protect or not to protect? Modes of appropriability in the small enterprise sector", *Research Policy*, Vol. 42 No. 1, pp. 35-49.

Tidd, J. and Bessant, J. (2009), *Managing Innovation – Integrating Technological, Market and Organizational Change*, (4th ed.), Wiley, Chichester.

Tranekjer, T.L. and Knudsen, M.P. (2012), "The (unknown) providers to other firms' new product development: what's in it for them?", *Journal of Product Innovation Management*, Vol. 29 No. 6, pp. 986-999.

Tsai, W. (2002), "Social structure of 'coopetition' within a multiunit organization: coordination, competition, and intraorganizational knowledge sharing", *Organization Science*, Vol. 13 No. 2, pp. 179-190.

Tsai, W. and Ghoshal, S. (1998), "Social capital and value creation: the role of intrafirm networks", *Academy of Management Journal*, Vol. 41 No. 4, pp. 462-476.

Tseng, C.Y. and Goo, Y.J. (2005), "Intellectual capital and corporate value in an emerging economy: empirical study of Taiwanese manufacturers", *R&D Management*, Vol. 35 No. 2, pp. 187-201.

Tushman, M.L. and Anderson, P. (1986), "Technological discontinuities and organizational environments", *Administrative Science Quarterly*, Vol. 31 No. 3, pp. 439-465.

Wang, Y.-L. and Ellinger, A.D. (2011), "Organizational learning: perception", *International Journal of Manpower*, Vol. 32 Nos 5/6, pp. 512-536.

West, J. and Bogers, M. (2014), "Leveraging external sources of innovation: a review of research on open innovation", *Journal of Product Innovation Management*, Vol. 31 No. 4, pp. 814-831.

Youndt, M.A., Subramaniam, M. andand Snell, S.A. (2004), "Intellectual capital profiles: an examination of investments and returns", *Journal of Management Studies*, Vol. 41 No. 2, pp. 335-361.

Zahra, S.A. and George, G. (2002), "Absorptive capacity: a review, reconceptualization, and extension", *The Academy of Management Review*, Vol. 27 No. 2, pp. 185-203.

Zahra, S., Sapienza, H. and Davidsson, P. (2006), "Entrepreneurship and dynamic capabilities: a review, model and research agenda", *Journal of Management Studies*, Vol. 43 No. 4, pp. 917-955.

Zhou, K.Z. and Li, C.B. (2012), "How knowledge affects radical innovation: knowledge base, market knowledge acquisition, and internal knowledge sharing", *Strategic Management Journal*, Vol. 33 No. 9, pp. 1090-1102.

Zobel, A.K., Lokshin, B. and Hagedoorn, J. (2017), "Formal and informal appropriation mechanisms: the role of openness and innovativeness", *Technovation*, Vol. 59, pp. 44-54.

Further reading

Argote, L. and Miron-Spektor, E. (2011), "Organizational learning: from experience to knowledge", *Organization Science*, Vol. 22 No. 5, pp. 1123-1137.

Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17 No. 1, pp. 99-120.

Bontis, N. (1998), "Intellectual capital: an exploratory study that develops measures and models", *Management Decision*, Vol. 36 No. 2, pp. 63-76.

Buenechea-Elberdin, M., Sáenz, J. and Kianto, A. (2018), "Knowledge management strategies, intellectual capital, and innovation performance: a comparison between high-and low-tech firms", *Journal of Knowledge Management*, Vol. 22 No. 8, pp. 1757-1781.

Kogut, B. and Zander, U. (1992), "Knowledge of the firm, combinative capabilities, and the replication of technology", *Organization Science*, Vol. 3 No. 3, pp. 383-397.

McLaughlin, P., Bessant, J. and Smart, P. (2008), "Developing an organisation culture to facilitate radical innovation", *International Journal of Technology Management*, Vol. 44 Nos 3/4, pp. 298-323.

Penrose, E. (1959), *The Theory of the Growth of the Firm*, Oxford University Press, Oxford.

Popadiuk, S. and Choo, S. (2006), "Innovation and knowledge creation: how are these concepts related?", *International Journal of Information Management*, Vol. 26 No. 4, pp. 302-312.

Sveiby, K.E. (1997), *The New Organizational Wealth: Managing and Measuring Knowledge-Based Assets*, Berret-Koehler, San Francisco, CA.

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