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Structured Abstract

Purpose – This study examines the association of different configurations of Intellectual Capital (IC) and Knowledge Management Practices (KMP) with firm performance. Do firms with different profiles concerning their overall levels of IC and KMP differ in terms of innovation and market performance?

Design/methodology/approach – First, the firms were distributed into four distinct profiles based on their overall level of IC and utilization of KMP. Then, the four different IC/KMP profiles were evaluated with regard to their innovation and market performance.

Findings – Consistent with the extant research, this study finds that the firms characterized with high levels of IC and high use of KMP are likely to outperform the firms with low overall levels of IC and KMP. On more interesting note, this study also demonstrates that firms characterized with high level of IC but only low utilization of KMP can match the innovation performance of the firms with high levels of IC and KMP.

Practical implications – While the results indicate that the level of IC alone could predict the innovation potential of the firm, the firms should use KMP to leverage the IC and to capitalize the knowledge potential. This result shows the merits of letting innovation flourish without strict managerial control, while pinpointing the relevance of knowledge management (KM) in exploitation of IC.

Originality/value – As one of the first attempts to merge the IC and KM approaches to find out which configurations could influence firm performance outcomes, this study provides the research community with valuable insights and sets the tone for further discussion.

Keywords – Knowledge management, knowledge management practices, intellectual capital, performance, innovation

Paper type – Research Paper

Introduction

Academics, practitioners, and policy makers broadly agree that knowledge is a crucial driver for firm performance and value creation (e.g. OECD, 1996; Grant, 1996; Makadok, 2001; Hamilton, 2006; Ferreira and Hamilton, 2010). The prominent academic discussion addressing the impact of knowledge-based issues on value creation is centered on the concepts of intellectual capital (IC) and knowledge management (KM). Intellectual capital refers to the overall intellectual assets that the company owns or possesses (Roos and Roos, 1997; Stewart, 1997; Sullivan, 1998) while knowledge management refers to the processes and practices that enable firms to manage their intellectual assets and to achieve knowledge-based competitive advantages (Alavi and Leidner, 2001; Davenport and Prusak, 1998; Heisig, 2009; Nonaka and Takeuchi, 1995; Von Krogh, 1998).

Given that both IC and KM literatures address the effect of intangibles on value creation and organizational success, they would be expected to be intertwined and parallel. However, these literatures largely use different perspectives and foundations due to their varying scholarly traditions. IC literature often adopts a static stock perspective, and KM literature a more dynamic, processual viewpoint (Kianto, 2007; Kianto *et al.*, 2014). While the extant literatures have provided the basic understanding on how an organization's knowledge resources and its practices to manage knowledge are associated with its performance, few studies have utilized both IC and KM approaches. This study argues that combining the static and dynamic—or the stock and flow—perspectives of knowledge yields a more comprehensive understanding of intangible bases of value creation than addressing only one side of the phenomenon.

To address the above-mentioned research gap, this study empirically examines how the firm's knowledge base (i.e. IC) and its ability to utilize and develop this base (i.e. KM) are associated with firm performance outcomes. The purpose is to examine firms with different profiles based on their overall levels of IC and knowledge management practices (KMP), and to identify any differences in innovation and market performance between firms with those profiles. The study utilizes a survey dataset collected from 259 Finnish companies with at least 100 employees, and then statistically analyzes differences in innovation and market performance between four different IC/KMP firm profiles.

Categorizing the data into four groups with high/low IC and KMP profiles reveals statistically significant group differences for innovation and market performance. The comparison of the four profiles shows that the firms strong both in overall IC and KMP are likely to outperform the firms with low overall IC and low KMP on both market and innovation performance measures. In addition, firms with a high level of IC but low usage of KMP enjoy equally strong innovation performance as those firms high in IC and KMP.

This paper is among the first attempts to merge the IC and KM disciplines to find out which configurations could yield organizational benefits in terms of innovation and market performance outcomes. The results thus respond to the recent calls for research that would combine IC and KM perspectives (Hsu and Sabherwal, 2012; Kianto *et al.*, 2014; Seleim and Khalil, 2011). The results also contribute to the broader scholarly discussion of the knowledge-based view, where knowledge-based assets are seen as both resources and capabilities (Grant, 1996; Spender, 1996).

Intellectual capital and knowledge management practices

The literatures of IC and KM address complementary aspects of the knowledge-based view (KBV) of the firm. The KBV sees knowledge both as a resource and as a capability, where utilizing and developing it is required to achieve competitive advantages (Grant, 1996; Spender, 1996; Spender and Grant, 1996).

IC focuses on all the intangible resources that a firm can use to achieve competitive advantage (Roos and Roos, 1997; Stewart, 1997; Sullivan, 1998). Typically, researchers argue that the overall IC of the firm is made up of three dimensions: human, structural/organizational, and relational/social capital (e.g. Bontis, 1998; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1997; Nahapiet and Ghoshal, 1998). Human capital refers to the firm's employees and their knowledge, capabilities, education, skills, and characteristics (Bontis, 1998; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1997). Structural/organizational capital refers to the IC that is owned by the firm and remains in the firm even when people leave work (Roos and Roos, 1997). Relational/social capital is the value embedded in and derived from relationships with customers, suppliers, partners, institutions, and other comparable stakeholders (Edvinsson and Malone, 1997; Roos and Roos, 1997; Nahapiet and Ghoshal, 1998). Lately, researchers have started to question the tripartite model's ability to recognize and measure the diverse nature of the firm's overall IC (Kaufmann and Schneider, 2004; Kianto, 2007; Kianto *et al.*, 2014). Therefore, dimensions such as renewal capital (Kianto, 2008; Inkinen *et al.*, 2014), trust capital (Mayer *et al.*, 1995; Inkinen *et al.*, 2014), and entrepreneurial capital (Erikson, 2002; Inkinen *et al.*, 2014) have been proposed to be included as components of IC.

KM deals with the processes and practices that enable firms to achieve knowledge-based competitive advantages (Alavi and Leidner, 2001; Davenport and Prusak, 1998; Heisig, 2009; Nonaka and Takeuchi, 1995; Von Krogh, 1998). According to a literature review by Heisig (2009), KM typically deals with four groups of critical success factors, consisting of human-oriented factors (culture, people, and leadership), organization-oriented factors (processes and structures), technology-oriented factors (infrastructure and applications), and management processes-oriented factors (strategy, goals, and measurement).

KM literature can be further divided into two categories; knowledge processes and KMP. The former area deals with the generic and broad knowledge-related activities within a firm, including knowledge acquisition, creation, sharing, and utilization (e.g. Andreeva and Kianto, 2011; Chen *et al.*, 2010; Ho, 2008; Hsiao *et al.*, 2011; Lee *et al.*, 2013). Such processes exist in a firm naturally even without managerial control (Andreeva and Kianto, 2012), and they vary based on the organizational context and different antecedents (for review, see Van Wijk *et al.*, 2008). The latter research stream, the KMPs, discusses the purposeful organizational and managerial practices that are utilized to generate knowledge-based competitive advantages and firm performance outcomes (Andreeva and Kianto, 2012; Kianto *et al.*, 2014). The KMP research avenue is characterized by dispersity and lacks established conceptualizations. Past studies, for instance, have varied from examination of knowledge-oriented leadership and knowledge-centered human resource (HR) practices (Donate and Guadamillas, 2011) to power distribution, top-management support, and information technology support (Lee *et al.*, 2012). Further, more recent papers have proposed amplified conceptualizations of KMP, such as a seven-practice model by Kianto *et al.* (2014) and a ten-practice model by Inkinen *et al.* (2015).

Aligned with the recent theoretical inputs (Inkinen *et al.*, 2014; Kianto *et al.*, 2014; Inkinen *et al.*, 2015), this study views IC as a firm's assets, and the KM explicitly from a practice perspective. In striving to understand what intangible resources the firm has and how it manages them, the practice perspective helps the study to focus on the deliberate managerial arrangements, rather than knowledge processes as "given." Likewise, this focus avoids the risk of mixing knowledge processes that take place naturally within the firm with IC, which also broadly refers to knowledge-related issues.

Intellectual capital, knowledge management practices, and firm performance

Competitive advantages increasingly accrue from knowledge resources and their utilization and development, as argued by the KBV (Grant, 1996; Kogut and Zander, 1992; Spender, 1996). Therefore, overall firm performance is expected to benefit from putting together a valuable knowledge-base (i.e.

IC) and managing it toward the set strategic goals (Zack, 1999) using purposeful knowledge management practices.

Various types of knowledge resources are typically needed to create value (Grant, 1996; Kogut and Zander, 1992; Spender and Grant, 1996). The empirical studies on IC have also pointed out that IC influences firm performance mainly through combinations and interactions of different IC dimensions (Kamukama *et al.*, 2010; Maditinos *et al.*, 2010; Sharabati *et al.*, 2010; Jardon and Martos, 2012; Kim *et al.*, 2012). The relationship between IC and firm performance can be also explained through improvement of innovation capabilities (Mathuramaytha, 2012; Menor *et al.*, 2007) and dynamic capabilities (Hsu and Sabherwal, 2012; Wu *et al.*, 2007). Further, a notable selection of empirical evidence suggests that IC is associated especially with innovation performance (Subramanian and Youndt, 2005; Carmona-Lavado *et al.*, 2010; Cabello-Medina *et al.*, 2011; Leitner, 2011; Wang and Chen, 2013), particularly by unlocking the intellectual potential through relational and social capital (i.e. open innovation; see Chesbrough, 2003; Huizingh, 2011).

In terms of KMP, researchers have argued that human resource management (HRM) practices in particular are critical supporting factors for KM (e.g. Chuang *et al.*, 2013; Hislop, 2003; Scarbrough, 2003; Wong, 2005). More recent papers have confirmed that HRM practices influence innovation performance by improving the knowledge processes such as knowledge acquisition, creation, sharing, and utilization (Chen and Huang, 2009; Kamhawi, 2012; Kuo, 2011; Soto-Acosta *et al.*, 2014); employees' affective commitment (Camelo-Ordaz *et al.*, 2011); and the trait of trust in relationships (Vanhala and Ritala, 2016). Supervisory work has been also argued as a key KMP for its capability in establishing a trustful and respectful atmosphere and a creative organizational culture (e.g. Holsapple and Singh, 2001), especially when supervisors participate, inspire, support, and delegate tasks to capable employees (Sarin and McDermott, 2003; Singh, 2008; García-Morales *et al.*, 2012; Birasnav, 2014). IT practices in KM have also been a topic of vivid discussion (e.g. Alavi and Leidner, 2001; Davenport and Prusak, 1998; Kankanhalli *et al.*, 2003; Nonaka and Takeuchi, 1995). Empirical examination has indicated an association between utilization of IT practices and a firm's innovation performance (Chuang *et al.*, 2013; Inkinen *et al.*, 2015; Kamhawi, 2012; Khalifa *et al.*, 2008; Yang *et al.*, 2009). Furthermore, strategic KM enables the firms to recognize the key strategic knowledge resources and focus their efforts on leveraging them to build competitive advantage (Barney, 1991; Conner and Prahalad, 1996; Grant, 1996; Zack, 1999). Strategic planning, implementation, and updating (Inkinen *et al.*, 2015) and the protection of strategic knowledge (Hurmelinna-Laukkanen, 2011) have been noticed as firm performance-enhancing strategic KMP. Deliberate learning mechanisms can also influence firm performance by tapping into all of the available knowledge within the organization and legitimizing vicarious learning (Inkinen *et al.*, 2015). Mechanisms such as collection and utilization of best practices and mentoring programs can be considered as ones that leverage the potentially prosperous tacit knowledge base of the firm. Finally, work organizing practices, especially in terms of creation of units and roles, can improve firm performance (Lee *et al.*, 2008; Migdadi, 2009). Through different organizational design solutions, the firms can create beneficiary conditions for knowledge-based work and therefore influence firm performance.

The following section presents a research design which examines IC and KMP in the same set of firms. The research design is based on categorizing the firms into four groups, according to whether they possess high or low levels of overall IC and high or low levels of KMP usage. The measurement models attempt to capture the complexity and breadth of different types of IC and KMP, but the study adopts a deliberately simple approach in analyzing the mean differences in firm performance between firms of different types of IC/KMP profiles. Using this approach, the combinations of IC and KMP levels in firms can be unambiguously assessed, producing research results that indicate whether firms differ in terms of their performance in this regard.

This study focuses on two types of firm performance outcomes: market performance and innovation performance. The former relates to the general competitiveness of the firm in its markets as compared to its competitors (Delaney and Huselid, 1996; Harel and Tzafrir, 1999), while the latter focuses on its relative competitiveness in introducing innovations to the markets (Bell, 2005; Weerawardena, 2003). This approach to performance measurement is explorative; in other words, no specific hypotheses for either performance type are created. In general, firm performance is expected to benefit from high levels of IC and KMP, as the previous literature suggests; however, these benefits might vary between different combinations of IC and KMP. The following section discusses the research methodology for this explorative research design.

Research design

Sample and data collection

This study employed survey data collected in Finland in 2013. The initial population (identified using the Intellia database) comprised cross-industry samples of Finnish companies with at least 100 employees. An external research company contacted all the eligible firms by telephone and asked the person in charge of human resources to respond to the questionnaire (i.e. the key informant technique was used). From the 1523 companies, 259 responses were received with the response rate of 17.0%. The highest number of responses were received from the industries of manufacturing (37.8%), wholesale and retail trade (16.2%), services (9.7%), and transportation and storage (8.1%). Most of the respondents identified themselves as the director or manager of HR (77.9%), other director or manager (8.8%), or managing director (6.9%). These positions indicated that they were experts in the issues of human resource management practices and organizational performance.

Measures

The comprehensive concept of IC is in its early stages. Additionally, previous research on KMPs is quite scarce. For example, the established measurement scales for KMP have typically incorporated only a few practices and overlooked some of those which were incorporated in the conceptual model of KMP in this study. Thus, it could be argued that established measurement scales do not exist; therefore, the measures for IC and KMP were both adapted from the previous literature and developed by the authors of this study. First, a thorough literature review was conducted to find empirically validated measurement scales. After that, to confirm the operational validity and psychometric robustness of the scales, the survey was pre-tested by means of statistical analyses with the sample of managers (N=146) collected from Finnish companies. To ascertain content validity of the scales, an international panel of experts assessed the scales and gave their insights for further development. The received feedback was incorporated into the final version of the survey.

Intellectual capital. This study measured IC with 22 items representing seven different dimensions. The measures were based on a five-point Likert scale (1-strongly disagree, 5-strongly agree), and respondents were asked to assess how the different statements on IC dimensions were applied in the organization they represented. The internal relational capital scale (3 items) was adapted from Kianto (2008) and was further inspired by Yang and Lin (2009); likewise, the scale for the structural capital (3 items) was adapted from Kianto (2008) and was further developed based on Kianto *et al.* (2010). The external relational capital scale (3 items) was adapted from Kianto (2008). The human capital scale (3 items) utilized the insights of both Bontis (1998) and Yang and Lin (2009). The scale for renewal capital (3 items) was built on work by Hughes and Morgan (2007), Kianto *et al.* (2010), and García-Morales *et al.* (2006). The authors of this paper developed the trust capital scale (4 items) with conceptual

inspiration from Mayer *et al.* (1995) and Vanhala *et al.* (2011). Finally, entrepreneurial capital (3 items) was measured using a scale inspired by Hughes and Morgan (2007).

Knowledge management practices. In total, 27 items measured 10 different dimensions of KMP. The respondents were asked to assess how the different statements on KMP applied to the organization they represented based on a five-point Likert scale (1-strongly disagree, 5-strongly agree). The authors of this paper created the supervisory work scale (5 items), the knowledge-based training and development scale (2 items), and the work organizing scale (3 items). The authors also created the learning mechanisms scale (2 items) with inspiration from Becerra-Fernandez and Sabherwal (2001). The knowledge protection scale (2 items) was adopted from Levin *et al.* (1987), Cohen *et al.* (2000), Hurmelinna-Laukkanen and Puumalainen (2007), Hurmelinna-Laukkanen and Ritala (2012), and Lawson *et al.* (2012). The strategic KM scale (2 items) was inspired by McKeen *et al.* (2005) and Boumarafi and Jabnoun (2008). Knowledge-based recruitment (2 items) was inspired by Yang and Lin (2009) and Cabello-Medina *et al.* (2011). Knowledge-based performance appraisal (3 items) and knowledge-based compensation (3 items) scales were inspired by Andreeva and Kianto (2012). Finally, the IT practices scale (3 items) was inspired by Handzic (2011), Negash (2004), and Pirttimäki (2007).

Performance. Market performance was measured on a scale developed by Delaney and Huselid (1996), and a scale for innovation performance relied on work by Weerawardena (2003). Market performance (2 items) was covered by asking respondents to compare their company's success against other companies in its sector. For innovation performance (4 items), respondents compared their company's success to the competitors' in terms of creating innovations or new operating methods. For both areas, respondents rated a list of different performance areas based on a five-point Likert scale (1-very poorly, 5-very well). Utilization of subjective performance assessments could be a potential constraint (see e.g. Starbuck, 2004). However, the extant research has suggested that measures of perceived performance do tend to correlate positively with objective measures (Acquaah, 2007; Delaney and Huselid, 1996; Kunze *et al.* 2013; Robinson and Pearce, 1988) and combined with a rigorous research design perceptual data is an adequate option (e.g. Howard, 1994; Minbaeva, 2012). Furthermore, this study examines market and innovation performance as *relative* measures, based on the respondents' assessment of how well their company fares against the competitors. This allows authors to assess the relative competitive benefits of particular IC / KMP profiles in the respondent companies' industry contexts. In addition, the validity of the subjective perceptions was ensured by consulting the practitioners and experts in the field.

See Appendix 1 for the measures and the wording of the items.

Assessment of bias

In the research setting of the study, one respondent per company provided data for independent and dependent variables. Thus, the common method bias (CMB) might cause some concerns. To control CMB, examples from previous literature (see e.g. Minbaeva *et al.*, 2012; Vaccaro *et al.*, 2012) were utilized.

First, to reduce the risk of CMB, respondent confidentiality was explicitly assured (see Tsai and Ghoshal, 1998; Minbaeva *et al.*, 2012). Such assurance makes respondents less likely to alter their answers due to how they think others may expect them to answer. In addition, the content of the survey was modified based on practitioner feedback to ensure clear and proper grammar and to keep the survey compact (MacKenzie and Podsakoff, 2012). Also, the fact that respondents were experts in the field decreased the possibility of CMB (see e.g. Rindfleisch *et al.*, 2008; MacKenzie and Podsakoff, 2012). Moreover, this study utilized different anchoring for the scales (different for performance measures than for IC and KMP) to decrease the possibility of CMB (e.g. Podsakoff *et al.*, 2003; Rindfleisch *et al.*, 2008; MacKenzie and Podsakoff, 2012).

Second, Harman's one-factor test (Podsakoff *et al.*, 2003) was conducted to assess the risk of bias. All the items from the constructs were included in the principal component analysis, and the largest factor accounted for 28% of the variance. This result suggests that common method variance bias was not a major concern in this study.

Results

Correlation analysis

Table 1 presents the correlation matrix, mean scores, and standard deviations for all the main variables.

Table 1 Correlation matrix

	<i>Mean</i>	<i>SD</i>	<i>1</i>	<i>2</i>	<i>3</i>
1. IC	3.58	0.43			
2. KMP	3.47	0.52	0.734**		
3. Market performance	3.39	0.74	0.319**	0.298**	
4. Innovation performance	3.33	0.57	0.427**	0.360**	0.371**

Notes: ** Correlation is significant at the 0.01 level

Measurement models and reliability

Confirmatory factor analysis (CFA) was conducted to test the measurement models. A total of 259 cases were processed by means of LISREL 8.50. PRELIS 2.50 was used to compute the covariance matrix, and the maximum likelihood estimation method was applied.

The CFA found that the loadings of all items were high and statistically significant (see Appendix 1), suggesting that they were all related to their specified constructs, verifying the posited relationships among the indicators and constructs. In terms of construct reliability, most of the constructs exceeded the level of .70. For some of the constructs, reliability measures fell somewhat short; specifically, these were structural capital (CR=.63), knowledge protection (CR=.65), and strategic KM (CR=.67). However, these constructs exceeded the more liberal level of .60 (Hair *et al.*, 2006).

Appendix 1 presents the final scales and model fit indices for the measurement models. The following three absolute-fit measures were obtained: the likelihood-ratio chi-square value, the root mean square error of approximation (RMSEA), and the goodness-of-fit index (GFI). Even though all the measures fell within acceptable levels, incremental measures (i.e. the non-normed fit index [NNFI], the comparative fit index [CFI], and incremental fit index [IFI]) were needed to ensure acceptability of the models from other perspectives.

In summary, the various measures of overall goodness-of-fit gave sufficient support to deem the results an acceptable representation of the constructs.

Analysis

First, summated scores (i.e. summed and averaged score of different dimension) of both intellectual capital and knowledge management practices were calculated to obtain a composite indicator for those. Based upon the scores, a median split (median for IC=3.57 and for KMP=3.50) was performed to obtain two sub-samples of subjects with low (sample size: 129, mean=3.23, SD=.26) and high (sample size: 130, mean=3.92, SD=.27) levels of IC as well as low (sample size: 129, mean=3.06, SD=.32) and high (sample size: 129, mean=3.88, SD=.29) levels of KMP.

Next, based on median split, the firms were distributed into four profiles:

- 1) **high IC** (mean of IC within the firms in this profile=3.75) and **low KMP** (mean of KMP within the firms in this profile =3.25)
- 2) **high IC** (3.97) and **high KMP** (3.94)
- 3) **low IC** (3.19) and **low KMP** (2.99)
- 4) **low IC** (3.35) and **high KMP** (3.71)

See Table 2 for more detailed information about the profiles.

Table 2 IC-KMP profiles

	Profile 1 High IC, low KMP (N=31)	Profile 2 High IC, high KMP (N=98)	Profile 3 Low IC, low KMP (N=98)	Profile 4 Low IC, high KMP (N=31)
1. IC	3.75	3.97	3.19	3.35
2. KMP	3.25	3.94	2.99	3.71

Finally, this study tested the differences of levels in market and innovation performance between the four profiles. This step used a one-way analysis of variance (ANOVA) comparison of means, with the Bonferroni post-hoc test for the comparisons.

Table 3 shows the level of market and innovation performance for different profiles as well as the results for the ANOVA tests. Based on ANOVA, there are statistically significant differences between profiles in both market and innovation performance.

Table 3 Performance in the profiles and results of the ANOVA

Performance		Profile	Mean
Market	F=7.519, sig. .000	1) High IC, low KMP	3.50
		2) High IC, high KMP	3.63
		3) Low IC, low KMP	3.14
		4) Low IC, high KMP	3.40
Innovation	F=19.208, sig. .013	1) High IC, low KMP	3.52
		2) High IC, high KMP	3.59
		3) Low IC, low KMP	3.05
		4) Low IC, high KMP	3.20

A post-hoc test of the ANOVA (see Table 4) shows in more detail the origin of the statistically significant differences between profiles and their performance. First, in terms of market performance, firms belonging to the profile 2 performed better than companies under the profile 3.

Second, in terms of innovation performance, the profile 2 outperformed the profiles 3 and 4. In addition, the innovation performance of the companies under the profile 1 seems to be better than those companies under the profile 3.

Table 4 Post-hoc test of the ANOVA

Performance	Profiles		Sig.	
Market	1) High IC, low KMP	2) High IC, high KMP	1.000	
		3) Low IC, low KMP	.107	
		4) Low IC, high KMP	1.000	
		1) High IC, high KMP	1.000	
	2) High IC, high KMP	3) Low IC, low KMP	.000	
		4) Low IC, high KMP	.791	
		1) High IC, low KMP	.107	
		2) High IC, high KMP	.000	
	3) Low IC, low KMP	4) Low IC, high KMP	.495	
		1) High IC, low KMP	1.000	
		2) High IC, high KMP	.791	
		3) Low IC, low KMP	.495	
	Innovation	1) High IC, low KMP	2) High IC, high KMP	1.000
			3) Low IC, low KMP	.000
			4) Low IC, high KMP	.104
			1) High IC, high KMP	1.000
2) High IC, high KMP		3) Low IC, low KMP	.000	
		4) Low IC, high KMP	.002	
		1) High IC, low KMP	.000	
		2) High IC, high KMP	.000	
3) Low IC, low KMP		4) Low IC, high KMP	.918	
		1) High IC, low KMP	.104	
		2) High IC, high KMP	.002	
		3) Low IC, low KMP	.918	

Discussion

The objective of this study was to examine how various IC and KMP profiles are associated with firm performance. Overall, the findings provide support for the idea that knowledge-based issues are important drivers of firm performance. This study is a response to the calls for more research combining IC and KM perspectives (Hsu and Sabherwal, 2012; Kianto *et al.*, 2014; Seleim and Khalil, 2011). Thus far, the two streams have remained rather separated, and these results are among the valuable early steps in providing more understanding to help combine these research avenues. With an explorative empirical research design, this study examined the differences between firms with different IC/KMP configurations in terms of their market performance and innovation performance. These results generally back up the claims about knowledge-based competitive advantage and firm performance gains (e.g. Kogut and Zander, 1992; Grant, 1996; Spender, 1996; Zack, 1999; Inkinen *et al.*, 2015), but with some managerially interesting notions related to innovation performance of the firm.

First, in terms of market performance, the comparison of the four IC/KMP profiles showed that firms strong in both overall IC and KMP are likely to outperform firms with low overall IC and low KMP. This finding indicates that both possession of sufficient levels of IC and the active utilization and development of it (KM) are required to increase a firm's competitiveness. This finding strengthens the arguments of Kianto *et al.* (2014), Seleim and Khalil (2011), and Wiig (1997) that the IC and KM approaches should be studied together to provide improved understanding of the bases of firm performance.

Second, regarding innovation performance of the firm, this study revealed that firms characterized by a high level of IC and high utilization of KMP (profile 2) are typically more innovative than the firms

that possess a low overall amount of IC (profiles 3 and 4). On more interesting note, firms with high overall IC and low utilization of KMP (profile 1) fared equally well in terms of innovation performance, when compared to firms in profile 2. Together, these two findings demonstrate that especially IC functions as an important resource for innovation and development activities, and that a sufficient overall amount of IC is a necessary precondition of innovativeness in a firm. This supports the suggestions of previous studies (e.g. Cabello-Medina *et al.*, 2011; Leitner, 2011; Hsu and Sabherwal, 2012) which have provided evidence on a relationship between IC and innovation performance. A notable and interesting distinction to previous KM literature is that a high level of KMP did not significantly improve the innovation performance of the firm. Existing research has demonstrated that utilization of KMP, including HRM practices (e.g. Soto-Acosta *et al.*, 2014; Vanhala and Ritala, 2016), supervisory work (e.g. Holsapple and Singh, 2001), and IT practices (e.g. Alavi and Leidner, 2001; Davenport and Prusak, 1998; Kamhawi, 2012), improves the innovation output of the firm. As the results of this paper deviate from earlier discussion, it creates an opportunity for further debate and research. It might be that, for innovativeness, the high potential embedded in different elements of IC (this study measured human capital, relational capital, structural capital, renewal capital, entrepreneurial capital, and trust capital) will help the company's innovation outputs to flourish in various types, levels, and contexts even without the purpose and control aspects provided through KMP. While this study provides evidence in this direction, the issue warrants more studies that could provide greater understanding of the underlying mechanisms of IC, KM, KMP and innovation performance.

Conclusion

Categorizing companies into four groups with high/low IC and KMP profiles exposed statistically significant group differences in terms of their innovation and market performance. The comparison of the four profiles demonstrated that knowledge-based issues show up on a company's bottom line, as the firms strong both in overall IC and KMP outperformed the firms with low overall IC and low KMP on both market and innovation performance measures. Peculiarly, companies with a high level of IC but low usage of KMP were found to be as innovative as those companies with high overall IC and KMP.

This paper is among the first attempts to merge the IC and KM approaches to find out which configurations could yield organizational benefits in terms of innovation and market performance outcomes. While it represents one of the first incremental steps toward constructing a comprehensive understanding of knowledge-based firm performance and value creation, it is laden with limitations. For example, this paper utilized rather rough average measure scores for constructing the IC/KMP profiles for the firms. In future studies, a more fine-grained assessment of different configurations of specific elements of IC and KMP should be built. That approach could bring about valuable managerial implications on which exact IC and KMP elements should the firms aim to combine to create competitive advantage. Second, to enable contrasting of the profiles, the IC and KMP constructs were aggregated in a simple, explorative manner (i.e. as dichotomous high/low variable pairs). This approach left unaddressed the nature of the IC/KMP pairing, which might be described in terms of mediation or moderation types of relationships (see Kianto *et al.*, 2014). Third, the contextual and contingent nature of knowledge and related processes (Sergeeva and Andreeva, 2015) means that the sample of Finnish firms with at least 100 employees is not sufficient to portray the full truth of the phenomenon. Instead, more studies with different kinds of companies from other regions are needed to understand the limits of these findings. Fourth, this study used subjective managerial assessments to measure innovation and market performance. Even though single-respondent bias was not detected in this study, the future studies should gather objective financial information for dependent firm performance variables. Fifth, the relationship between IC, KMP and firm performance is an issue of considerable complexity, and various kinds of firm-level characteristics are likely to moderate and mediate it. For example, the firm's

business model and its strategic choices may function as important moderators. Examining these in-depth provides one potential fruitful avenue for future research. Overall, combining the IC and KM approaches to organizational performance is expected to represent a wide and fruitful field for future studies.

The managerial learning point of this study is that different configurations of IC and KMP could yield equally good firm performance outcomes. In knowledge economy one size does not fit all. Specifically, this study points out that, while the level of IC alone could predict the innovation potential of the firm, organizational and managerial practices to leverage the IC are needed to unchain the knowledge potential and convert it into market performance. This result is interesting for knowledge and innovation management research and practice, since it shows the merits of letting innovation flourish without much managerial control, while pinpointing the increasing relevance of KM when creating IC-based competitive advantage. In practice, organizations should grant their members a freedom to explore and innovate during times when innovations are in the strategic focus, but as well steer attention to efficiency and effectiveness when the accumulated knowledge needs to be leveraged to maintain competitiveness.

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Appendix 1 Measurement items, factor loadings and model fit indices.

IC	To what extent do the following statements on...apply to your company? (1 = completely disagree, 5 = completely agree)	
Internal relational capital	Different units and functions within our company – such as R&D, marketing and production – understand each other well	0.616 ^a
	Our employees frequently collaborate to solve problems.	0.771***
	Internal cooperation in our company runs smoothly.	0.721***
	CR	0.75
External relational capital	Our company and its external stakeholders – such as customers, suppliers and partners – understand each other well.	0.62 ^a
	Our company and its external stakeholders frequently collaborate to solve problems.	0.776***
	Cooperation between our company and its external stakeholders runs smoothly.	0.776***
	CR	0.77
Structural capital	Our company has efficient and relevant information systems to support business operations.	0.518 ^a
	Our company has tools and facilities to support cooperation between employees.	0.602***
	Our company has a great deal of useful knowledge in documents and databases.	0.679***
	CR	0.63
Human capital	Our employees are highly skilled at their jobs.	0.736 ^a
	Our employees are highly motivated in their work.	0.626***
	Our employees have a high level of expertise.	0.827***
	CR	0.78
Renewal capital	Our company has acquired a great deal of new and important knowledge.	0.613 ^a
	Our company can be described as a learning organisation.	0.748***
	The operations of our company can be described as creative and inventive.	0.773***
	CR	0.76
Trust capital	The way our company operates is characterised by an atmosphere of trust.	0.73 ^a
	We keep our promises and agreements.	0.677***
	Our company seeks to take the interests of its stakeholders into account in its operations.	0.603***
	The expertise of our company inspires trust in stakeholders.	0.613***
CR	0.75	
Entrepreneurial capital	Our employees are excellent at identifying new business opportunities.	0.746 ^a
	Our employees show initiative.	0.745***
	Our employees have the courage to make bold and difficult decisions.	0.752***
	CR	0.79
Chi-square (df)		326.97 (188)
p-value		0
RMSEA		0.054
GFI		0.897
CFI		0.978
NNFI		0.973
IFI		0.978

KM practices	To what extent do the following statements on...apply to your company? (1 = completely disagree, 5 = completely agree)	
Supervisory work	Supervisors encourage employees to share knowledge at the workplace.	0.803 ^a
	Supervisors encourage employees to question existing knowledge.	0.714***
	Supervisors allow employees to make mistakes, and they see mistakes as learning opportunities.	0.663***
	Supervisors value employees' ideas and viewpoints and take them into account.	0.727***
	Supervisors promote equal discussion in the workplace.	0.704***
	CR	0.85
Knowledge protection	Our company's strategic knowledge is protected from those stakeholders to whom it is not intended	0.806 ^a
	If necessary, our company uses patents, agreements, legislation and other formal means to protect its strategic knowledge.	0.579***
		CR
Strategic KM	Our company strategy is formulated and updated based on company knowledge and competences.	0.644 ^a
	Our knowledge and competence management strategy is communicated to employees clearly and comprehensively.	0.776***
		CR
Knowledge-based recruiting	When recruiting, we pay special attention to learning and development ability.	0.672 ^a
	When recruiting, we evaluate the candidates' ability to collaborate and work in various networks.	0.746***
		CR
Knowledge-based training & development	We offer our employees opportunities to deepen and expand their expertise.	0.758 ^a
	Our employees have an opportunity to develop their competence through training tailored to their specific needs.	0.838***
		CR
Knowledge-based performance appraisals	The sharing of knowledge is one of our criteria for work performance assessment.	0.751 ^a
	The creation of new knowledge is one of our criteria for work performance assessment.	0.765***
	The ability to apply knowledge acquired from others is one of our criteria for work performance assessment.	0.737***
		CR
Knowledge-based compensation	Our company rewards employees for sharing knowledge.	0.81 ^a
	Our company rewards employees for creating new knowledge.	0.8***
	Our company rewards employees for applying knowledge.	0.809***
		CR
Learning mechanisms	Our company systematically collects best practices and lessons learned.	0.867 ^a
	Our company makes systematic use of best practices and lessons learned.	0.911***
		CR

IT practices	Our company uses information technology in internal communication throughout the organisation.	0.65 ^a
	Our company uses information technology to communicate with external stakeholders.	0.62***
	Our company uses information technology to collect business knowledge related to its competitors, customers and operating environment, for example.	0.661***
	CR	0.68
Work organizing	Our employees have an opportunity to participate in decision-making in the company.	0.674 ^a
	In our company, work duties are defined in a manner that allows for independent decision-making.	0.649***
	When necessary, we use working groups with members who possess skills and expertise in a variety of fields.	0.565***
	CR	0.66
Model fit indices	Chi-square (df)	363.83 (279)
	p-value	0.00047
	RMSEA	0.034
	GFI	0.905
	CFI	0.989
	NNFI	0.986
	IFI	0.989
Performance	Compared to other companies in its sector, how do you think your company has succeeded in the following areas over the past year? (1 = very poorly, 5 = very well)	
Market performance	Net sales growth	0.704 ^a
	Profitability	0.757***
	CR	0.70
	Compared to its competitors, how successfully has your company managed to create innovations/new operating methods in the following areas over the past year? (1 = very poorly, 5 = very well)	
Innovation performance	Products and services for customers	0.540 ^a
	Management practices	0.592***
	Marketing practices	0.535***
	Business models	0.771***
	CR	0.71
Model fit indices	Chi-square (df)	15.70 (8)
	p-value	0.04695
	RMSEA	0.061
	GFI	0.980
	CFI	0.981
	NNFI	0.965
	IFI	0.981

Note: ^a Significance level is not available, because the coefficient is fixed at 1. *** Statistically significant at 0.01 significance level.