Henri Inkinen

INTELLECTUAL CAPITAL, KNOWLEDGE MANAGEMENT PRACTICES AND FIRM PERFORMANCE

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Abstract

Henri Inkinen
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Researchers have widely recognised and accepted that firm performance is increasingly related to knowledge-based issues. Two separately developed literature streams, intellectual capital (IC) and knowledge management (KM), have been established as the key discussions related to knowledge-based competitive advantage of the firm. Intellectual capital has provided evidence on the strategic key intangible resources of the firm, which could be deployed to create competitive advantage. Knowledge management, in turn, has focused on the managerial processes and practices which can be used to leverage IC to create competitive advantage. Despite extensive literature on both issues, some notable research gaps remain to be closed. In effect, one major gap within the knowledge management research is the lack of understanding related to its influence on firm performance, while IC researchers have articulated a need to utilise more fine-grained conceptual models to better understand the key strategic value-creating resources of the firm.

In this dissertation, IC is regarded as the entire intellectual capacity, knowledge and competences of the firm that can be leveraged to achieve sustained competitive advantage. KM practices are defined as organisational and managerial activities that enable the firm to leverage its IC to create value. The objective of this dissertation is to answer the research question: “What is the relationship between intellectual capital, knowledge management practices and firm performance?” Five publications have addressed the research question using different approaches. The first two publications were systematic literature reviews of the extant empirical IC and KM research, which established the current state of understanding regarding the relationship between IC, KM practices and firm performance. Publications III and IV were empirical research articles that assessed the developed conceptual model related to IC, KM practices and firm performance. Finally, Publication V was among the first research papers to merge IC and KM disciplines in order to find out which configurations could yield organisational benefits in terms of innovation and market performance outcomes.

Keywords: dissertation, intellectual capital, knowledge management, knowledge management practices, firm performance
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Helsinki, April 2016

Henri Inkinen
“Do or do not. There is no try.”

Master Yoda
The Empire Strikes Back (1980)
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This thesis is based on the following papers. The rights have been granted by publishers to include the papers in dissertation.


Author’s contribution

PUBLICATION I: “Review of empirical research on intellectual capital and firm performance”:

The author was the sole contributor of this article.

PUBLICATION II: “Review of empirical research on knowledge management practices and firm performance”:

The author was the sole contributor of this article.


The author made a major contribution to the survey design, data collection, development of the theoretical framework of the study, positioning of the study and writing the paper.

PUBLICATION IV: “Knowledge management practices and innovation performance in Finland”:

The author made a major contribution to the survey design, data collection, development of the theoretical framework of the study, positioning of the study and writing the paper.

PUBLICATION V: “Intellectual capital, knowledge management practices and firm performance”:

The author made a major contribution to the survey design, data collection, development of the theoretical framework of the study, positioning of the study and writing the paper.
1 Introduction

The source of the firm’s competitive advantage has shifted from tangible resources and the capability to deploy them (e.g. Penrose, 1959; Wernerfelt, 1984; Barney, 1991; Conner, 1991; Makadok, 2001) to intangibles such as the firm’s knowledge base and the capabilities to manage, utilise and develop it (e.g. Kogut and Zander, 1992; Grant, 1996; Spender, 1996). Several reports have estimated that the most of the corporate value is now based on intellectual assets (Edvinsson and Malone, 1997) and that the majority of global wealth is intangible (Ferreira and Hamilton, 2010; Hamilton, 2005).

This phenomenon has been most profoundly discussed within two parallel academic literature streams: intellectual capital (IC) and knowledge management (KM). IC, which is typically measured in terms of human, structural/organisational and relational capital, regards the intangible resources of the firm that can be leveraged to create value and economic wealth (Bontis, 1998; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1997; Sullivan, 1998), whereas KM deals with the practices and processes that enable efficient and effective management of knowledge resources (e.g. Alavi and Leidner, 2001; Davenport and Prusak, 1998; Nonaka and Takeuchi, 1995; Von Krogh, 1998).

Even though IC and KM have gained momentum during the past two decades and have managed to provide the basic understanding on how knowledge and its management processes and practices are associated with firm performance, there are still many gaps within the literature that should be addressed. For instance, a recent interview of over 200 KM experts suggested that there is a lack of understanding on how KM is associated with firm performance (Heisig, 2014; Perez-Arrau et al., 2014). Also, there is room for pinpoint managerial contribution, as the majority of the KM literature has dealt with generic knowledge processes that take place even without managerial control (e.g. knowledge acquisition, creation and sharing; see e.g. Chen et al., 2010; Lee et al., 2013). On the other hand, the discussion on KM practices, which is conceptualised as conscious organisational and managerial activities that enable a firm to leverage its IC to create competitive advantage (Andreeva and Kianto, 2012; Kianto et al., 2014), has been much more scarce. Measurement issues constitute another major gap; IC has been typically measured with a tripartite model, including human, structural/organisational and relational capital dimensions (e.g. Bontis, 1998; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1997; Sullivan, 1998), which scholars have recently criticised for its inability to tap into the diverse nature of organisational knowledge (e.g. Kaufmann and Schneider, 2004; Kianto, 2007). In contrast, KM practices constitute a novel concept within literature; as a result, researchers have not yet reached a consensus on how to measure it. Better understanding of KM practice measurement should be developed, as the firm’s development and deployment activities related to knowledge resources is as crucial feature in creation of competitive advantage as its access to knowledge resources (Conner, 1991; Grant, 1996; Spender, 1996). A solid measurement of the KM practices construct allows researchers to verify or falsify theories related to it (e.g. Churchill, 1979), for instance its association with firm performance outcomes. Disambiguation also exists
between the concepts of IC and KM, as they have developed into separate research avenues even though they typically deal with similar knowledge-based issues of a firm (Kianto et al., 2014).

This dissertation addresses the identified research gaps with two complementary strategies: First, two systematic literature reviews have been conducted to clarify the conceptualisations and terminology regarding IC and KM practices, as well as to recap the current understanding on the relationship between IC and firm performance, and the association between KM practices and firm performance. Second, a conceptual model was developed and empirically tested to examine how an amplified categorisation of IC and a novel concept of KM practices are associated with firm performance. The aim of this dissertation is to contribute to the wider discussion on the knowledge-based view of the firm (KBV) and to both IC and KM literature by demonstrating the most valuable IC dimensions and KM practices that can be used to create firm performance benefits. Also, managerial guidelines for recognising and deploying the key strategic IC dimensions and selecting the most effective KM practices to leverage the firm’s IC are elaborated.

1.1 Background

The resource-based view of the firm (RBV) has demonstrated that competitive advantage accrues from resources that are valuable, rare, inimitable and non-substitutable (Barney, 1991). The capabilities to deploy those resources are seen as equally important drivers of competitive advantage (e.g. Conner, 1991; Makadok, 2001; Wernerfelt, 1984). The KBV shares fundamental similarities with the RBV, but it highlights knowledge as the key strategic resource of the firm because of its natural valuable characteristics such as inimitability (Grant, 1996; Kogut and Zander, 1992; Spender, 1996). The core argument of the KBV summates that competitive advantage accrues from possession and deployment of valuable knowledge resources (Grant, 1996; Kogut and Zander, 1992; Spender, 1996). From the firm’s perspective, its role is to deploy its knowledge resources to produce service and products, while its management’s task is to facilitate knowledge coordination (Grant, 1996).

The KBV has received considerable attention from management scholars during the past two decades. The KBV-based discussion is nowadays affiliated with two independently developed literature streams: IC and KM. IC relates to the KBV by operationalising and measuring the valuable intangible resources of the firm, including all knowledge and competences that can be used to create sustainable competitive advantage (Roos and Roos, 1997; Stewart, 1997; Sullivan, 1998). IC is typically measured with a tripartite model including human, structural/organisational and relational capital dimensions (e.g. Bontis, 1998; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1997). While this three-fold categorisation has been successfully utilised to provide basic understanding of the association between key knowledge resources and firm performance outcomes (e.g. Bontis, 1998; 2001), some researchers have called for the redesign and retooling of the IC measurement models in order to capture the whole essence of the
phenomenon within a modern firm (e.g. Kaufmann and Schneider, 2004; Kianto, 2007); thus, in this dissertation, a more fine-grained conceptual model of IC was developed in order to improve the recognition of the firm’s most valuable knowledge assets and turn the attention and investments to the most value-increasing activities.

KM deals with the practices and processes that enable firms to unleash their intellectual potential through a competent management of their knowledge resources (e.g. Gold et al., 2001; Lee and Choi, 2003; Heisig, 2009); therefore, KM represents the capability and activity-oriented facet of the KBV. The majority of the KM literature has dealt with generic knowledge processes, such as knowledge acquisition, creation and sharing, that exist spontaneously within firms even without managerial input or control (e.g. Chen et al., 2010; Ho, 2008; Hsiao et al., 2011; Lee et al., 2013). Consequently, managerial implications of that research stream have been rather limited, as studies have not been able to crystallise what the firms and managers should do to improve the management of the firm’s knowledge base and transform it into enhanced firm performance outcomes. Therefore, a novel concept of KM practices has recently gained interest from researchers. KM practices differentiate from knowledge processes as they are conscious organisational and managerial activities that enable the firm to leverage its IC to create value (e.g. Andreeva and Kianto, 2012; Kianto et al., 2014). The literature on KM practices is scarce as the discussion has just recently commenced. However, it shows promise for both research and managerial implications. For research, this novel area of discussion can potentially provide synergy benefits as it overlaps with other research domains just like KM literature in general (Ragab and Arisha, 2013). From the managerial perspective, the main contribution of KM practice discussion is in the identification of the selection of practices that can be utilised for successful management of IC for improved firm performance.

1.2 Research gaps addressed by the dissertation

Even though the seminal papers on the KBV have demonstrated that possession of knowledge (i.e. IC) and the ability to utilise and develop it (i.e. KM) are key sources to competitive advantage (Grant, 1996; Kogut and Zander, 1992; Spender, 1996), the literature still lacks evidence on how those approaches are associated with firm performance outcomes. Specifically, even though KM has emerged as one of the most debated novel approaches within the management literature during the last two decades, one of the major gaps is still the lack of understanding on the association between KM and firm performance (Heisig, 2014; Perez-Arrau et al., 2014). On the other hand, the typical tripartite measurement model of IC lacks in tapping into the diversity of intangible resources within a modern firm (Kaufmann and Schneider, 2004; Kianto, 2007). Therefore, more research is needed to increase the understanding of how IC and KM are linked with firm performance outcomes.

KM literature has been split between research avenues of knowledge processes (e.g. knowledge acquisition, creation, sharing and utilisation) (e.g. Chen et al., 2010; Ho, 2008;
Hsiao et al., 2011; Lee et al., 2013) and KM practices (e.g. Andreeva and Kianto, 2012; Kianto et al., 2014). The earlier stream has not been able to provide pinpointed managerial implications as it is primarily concerned with a phenomenon that is spontaneous and could flourish even without managerial input. The association between KM practices and firm performance has been left almost untouched within the extant literature, offering a chance to unleash untapped potential that could be helpful for both researchers and practitioners. However, there is no established model to measure KM practices. An overarching conceptual model that includes the key managerial and organisational practices for efficient and effective management of the IC of the firm would be highly beneficial for researchers and managers.

The parallel literature streams on IC and KM have caused conceptual and empirical confusion, as both IC and KM consist of similar contents (Kianto et al., 2014). What has caused especial ambiguity is the definition of IC: the suggested definitions range from a passive point-of-view wherein IC is seen exclusively as an asset (e.g. IC accounting; see e.g. Ricceri, 2008; Guthrie et al., 2012; Dumay, 2014) to more liberal interpretations that include also processes and capabilities (e.g. Edvinsson and Malone, 1997; Roos et al., 1998). Also, regarding the KM literature, knowledge has been discussed both as a valuable resource as well as a process within a firm (Kianto et al., 2014). The KBV-based literature would benefit from conceptual clarification. That includes the identification of the key IC dimensions that constitute the knowledge base of a firm, as well as distinguishing the crucial KM practices that are most suitable in leveraging the IC for firm performance gains.

1.3 Objectives of the study

The overall objective of this dissertation is to increase the understanding related to the association between IC and firm performance and KM practices and firm performance. The recent interview of KM experts indicated that the lack of understanding on the association between KM and firm performance remains one of the main obstacles (Heisig, 2014; Perez-Arrau et al., 2014), and the specific area of KM practices is even more unknown for both researchers and practitioners. Moreover, IC research has been slowed because the measurement models have not explored the detailed organisational knowledge outside of the tripartite model of human, structural/organisational and relational capital; accordingly, researchers have begun to call for an updated mind-set (Kaufmann and Schneider, 2004; Kianto, 2007). Therefore, this dissertation is focused on one main research objective:

What is the relationship between intellectual capital, knowledge management practices and firm performance?

In order to answer the main research question, the current body of literature was first reviewed to identify the key IC dimensions and KM practices, as well as to establish how the concepts are associated with different firm performance outcomes. To meet this
objective, two systematic literature reviews were conducted that aimed at answering the following two sub-questions:

I. What is the current understanding on how the intellectual capital dimensions influence firm performance outcomes?

II. What is the current understanding on how knowledge management practices influence firm performance outcomes?

After presenting the results of the literature reviews, this study moves on to the empirical section, which consists of three papers, each of which concentrated on answering one sub-question, respectively. The first empirical paper introduced an amplified ten-dimensional categorisation of IC and empirically tested how it was related to firm performance in the context of Finnish companies with over 100 employees; thus, it aimed at providing an answer to the third sub-question:

III. What is the association of different intellectual capital dimensions with innovation and market performance of the firm?

The fourth publication empirically assessed the newly developed conceptual regarding KM practices and firm performance. It introduced a set of ten KM practices and focused on answering the following sub-question:

IV. What is the association of different knowledge management practices with innovation performance of the firm?

Finally, the fifth publication capped this dissertation by merging IC and KM practices to provide understanding on a rather untapped area of how coexistence of IC and KM practices influence firm performance outcomes:

V. What is the association of different levels of intellectual capital and utilisation of knowledge management practices with innovation and market performance of the firm?

1.4 Structure of the study

The dissertation begins by providing background knowledge on the examined issues, identifying the research gaps, and providing the outlines and objectives for the study. In the second chapter, the theoretical points of departure are explained, which helps the reader to understand the position of this dissertation against the existing research. In the third chapter, the methodological choices are discussed and justified. In the fourth chapter, the objectives and results of the five research papers are summarised one by one, followed by a summary of all results. The five research papers and their objectives are depicted in Figure 1. Then, in the fifth chapter, the contribution of the results is discussed
with regard to the research question. Also, the implications to research and practice are elaborated before a short conclusion of the entire study.

**Figure 1.** The research questions and the related publications
1.5 Definitions

1.5.1 Intellectual capital

IC refers to the entire intellectual capacity, knowledge and competences of the firm that can be leveraged to achieve sustained competitive advantage (e.g. Roos and Roos, 1997; Stewart, 1997; Sullivan, 1998). Typically, IC is divided into a three-dimensional categorisation including human, structural/organisational and relational capital (e.g. Bontis, 1998; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1997). In an attempt to advance the discussion on IC to a more detailed level, this study further enriches the dimensionality of IC by including renewal capital (e.g. Kianto et al., 2010), entrepreneurial capital (e.g. Erikson, 2002) and trust capital (Mayer et al., 1995). Also, relational capital is split into internal and external dimensions, as they regard different stakeholder relationships and influence firm performance (e.g. innovation) differently (Cassiman and Veugelers, 2006). In sum, this dissertation defines IC as all the knowledge that a firm can leverage to gain competitive advantage, including human, structural, internal relational, external relational, trust, renewal and entrepreneurial capital.

1.5.2 Knowledge management practices

KM practices are organisational and managerial activities that enable a firm to leverage its IC to create value (Kianto et al., 2014). KM practices should not be confused with more generic knowledge processes, such as knowledge acquisition, creation and sharing, which are spontaneous knowledge-based activities that exist in a firm even without managerial control or moderation. The KM practices this dissertation deals with are supervisory work, knowledge protection, strategic management of knowledge and competence (strategic KM), learning mechanisms, information technology (IT) practices, work organising, and four dimensions of human resource management (HRM) practices, including knowledge-based recruiting, training and development, performance appraisal, and compensation practices.

1.5.3 Firm performance

Firm performance measurement has developed into an active debate that is participated by academics, business managers and policymakers alike. However, even though performance measurement is often discussed in the management literature, it is rarely defined (Neely et al., 1995). It has become quite a popular approach within academic research to measure firm performance in terms of effectiveness and efficiency (e.g. Porter, 1985; Barney, 2002), wherein effectiveness stands for the firm’s ability to achieve its business goals and efficiency refers to how economically a firm is able to utilize its resources to meet the set goals (see e.g. Neely et al., 1995). This dissertation measured how effectively a firm has been able to achieve innovation and market performance goals.
compared to its competitors (i.e. dependent variables), and more importantly, how efficiently it has been able to deploy its IC resources and KM practices (i.e. independent variables) in the process of achieving its business goals. That is, respondents were requested to subjectively assess firm performance against the performance of their rival companies. This sort of benchmarking has been stated as a sound approach to gain knowledge especially on innovation performance (Voss et al., 1992).

One approach related to performance measurement in the KM context is that traditional quantitative input and output measures are unsuitable for measuring the productivity of knowledge work (Antikainen and Lönnqvist, 2005). Therefore, researchers have typically utilized subjective firm performance measures to analyse how they are influenced by KM (Payal and Debnath, 2015). Subjective performance measures have been argued to be more capable than objective calculation measures in capturing the whole essence of the ambiguous KM phenomena (Lönnqvist, 2004).

In sum, within the empirical part of the dissertation, performance refers to firm-level performance outcomes, which reflect the subjective assessment of one key informant per responding firm. The two systematic literature reviews also included only articles which had measured firm-level performance outcomes, but assessment methods varied from objective financial data to subjective firm performance measures.

1.5.4 Resource-based competitive advantage

This study assumes that resources, including knowledge resources, are distributed unevenly between firms, which permits discussion on the resource-based competitive advantage of the firm (Barney, 1991). Also, it is assumed that the resources can be immobile and unavailable to the firm’s rivals, which allows the heterogeneity and competitive advantage to continue over a long period of time (Barney, 1991).
2 Theoretical premises of the dissertation

2.1 From resource-based view to knowledge-based view of the firm

Discussion on the theoretical basis of this study are fundamentally founded on the RBV. The RBV primarily examines the firm’s internal characteristics and their relation to firm performance (Barney, 1991). The central idea of the RBV is that the firm’s competitive advantage accrues by and large from the idiosyncratic resources they possess (Conner, 1991; Penrose, 1959). In addition to the uneven distribution of resources between firms, the resources can be also immobile and unavailable to the rivals, which allows the heterogeneity and competitive advantage to continue over time (Barney, 1991).

Resources are attributes of the firm that are able to “exploit opportunities or neutralize threats in a firm’s environment” (Barney, 1991, p. 106). Resources include all the firm-specific strengths and weaknesses (Wernerfelt, 1984) including assets, capabilities, processes, organisational attributes, and knowledge controlled by the organisation (Barney, 1991). This all-inclusive listing was intended to be among the main strengths of the RBV (Barney, 2001) but it has been also claimed as overly inclusive (e.g. Priem and Butler, 2001) as it effectively considers nearly all firm-related attributes as resources and adjudges the non-resource factors as useless, it does not differentiate between regular resources and capabilities, and it does not discuss on how different resources contribute on to a firm’s sustainable competitive advantage (Kraaijenbrink et al., 2010).

Competitive advantage is not entirely dependent solely on the resources that the firm possesses, but also on the competences and capabilities to leverage the resource base (Barney, 1986; Conner, 1991; Wernerfelt, 1984). What conceptually differentiates capabilities from the “regular” resources is that capabilities are used to leverage the other resources (Makadok, 2001). In effect, a firm is likely to outcompete its rivals if it is capable of getting hold of and deploying better resources to reach the desired result (Amit and Schoemaker, 1993; Conner, 1991). Conner (1991) stated that value is created especially through a combination of different resources. Also the capabilities are mostly firm-specific because of their embeddedness in its processes and the fundamental difficulty to transfer them outside the firm’s boundaries (Makadok, 2001).

A resource has potential to create sustained competitive advantage if it is valuable, rare, inimitable and non-substitutable (the so-called VRIN attributes) (Barney, 1991). The resources are valuable when they enable exploiting opportunities or neutralising threats in a firm’s environment. In turn, rareness refers to a resource or a bundle of resources capable of creating competitive advantage as it is not simultaneously utilised by a large number of rival firms. Further, inimitability describes resources that have been developed over time or characterised with a social complexity and thus cannot be reverse-engineered without a significant effort because of the imperfect understanding of how they affect the competitive advantage. Finally, non-substitutability means that there should not be strategically equivalent resources that enable the rival firms to implement the same value-creating strategy. (Barney, 1991)
The VRIN attributes indicate the level of heterogeneity and immobility of a firm’s resources, and therefore the potential of a particular resource to create sustainable potential advantage (Barney, 1991). Thus, it can be derived that the more the VRIN attributes come true, the better chance there is that a deployment of that resource is able to create competitive advantage or sustained competitive advantage. For example, a resource that does not bear value-creating potential cannot be strategically important, and a valuable resource that is common cannot be an advantage only for some firms. Moreover, a resource that is valuable and rare is hardly a source of sustained competitive advantage if it can be easily imitated by the rivals. Likewise, if a valuable, rare and inimitable resource can be substituted with a similar or different other resource that enables the rivals to implement the same value-creating strategy, it is likely not a source of sustained competitive advantage.

The resources with VRIN attributes create long-term competitive advantage as they cannot be directly acquired by a firm, but they instead have to be attained from the firm’s current resource base (Dierickx and Cool, 1989). That highlights the importance of firm-specificity and inimitability of the resources as determinants of above average returns (Rumelt, 1987). As such, the same value-creation strategy cannot be, without significant efforts, implemented by the firm’s rivals (Barney, 1991). The same rule-of-thumb applies to capabilities, as firms have to build them instead of buying ready from the market (Teece et al., 1997). Furthermore, capabilities are not valuable as such, but only after they are used on resources that are available for a firm, which further increases the inimitability factor of both resources and capabilities (Makadok, 2001). Ultimately, the arguments of the RBV are more likely to actualize in quite stable business environments, that is to say, if the value and relevance of resources and competences changed frequently and dramatically, a firm’s competitive advantage should be explained in alternative ways (Barney, 2002). In particular, achieving sustainable competitive advantage in a dynamic environment requires that a firm focuses on securing relevant dynamic capabilities (Helfat et al., 2007).

The KBV considers knowledge as the key strategic resource of a firm (Grant, 1996; Spender, 1996) and that the firm’s internal knowledge and its development and deployment are in the focal point of competitive advantage (Conner, 1991; Grant, 1996; Spender, 1996); thus, it shares the same foundational principles as the RBV (Conner and Prahalad, 1996; Grant, 1996). The KBV agrees with the RBV in that a firm’s internal characteristics weigh more than its product-market position. The KBV argues that value production typically requires a combination of various types of specialised knowledge (Grant, 1996; Grant and Baden-Fuller, 2004; Kogut and Zander, 1992). Especially collective knowledge, which regards the combination of knowledge between people, groups, units and organisations, can be strategically the most significant resource of the firm (Spender, 1996). Summing up the central message of the KBV, it argues that some firms are capable of generating above average returns due to the differently distributed knowledge bases and the capabilities in using and developing knowledge (Grant, 1996; Kogut and Zander, 1992; Spender, 1996).
A noteworthy distinction is that the KBV treats knowledge as a special resource in several fundamental, non-trivial ways. First, knowledge is a distinctive resource because of its activity-relatedness and inter-subjective nature; knowledge is highly context-dependent and embedded in human and social interactions (Pöyhönen, 2004). Especially the firm’s tacit knowledge, which is learned through personal experience, practically hidden from rivals and embedded in human action, can aspire competitive advantage, as it is too complex to be codified or transferred to another firm without a great effort (Conner and Prahalad, 1996; Grant, 1996; Kogut and Zander, 1992). Knowledge, therefore, cannot be controlled like tangible resources, but firms can unleash its value-creation potential by building facilitating conditions for the generation and application of knowledge (Von Krogh, 1998).

Knowledge resources also benefit from the economies of scale and scope because knowledge reproduction is cheaper than its initial creation (e.g. Shapiro and Varian, 1999), and that knowledge can be reapplied after its initial use to suit various different purposes (Kogut and Zander, 1992). Also, in terms of re-application, a defining characteristic of knowledge is that it becomes more valuable the more it is used, unlike tangible resources (Grant, 1996; Zack, 1999a). In fact, knowledge without utilisation is worthless, while repeatedly used knowledge is more likely to be a significant resource of the firm.

The firm’s internal intangible knowledge resources are important also in the respect that they add value to the incoming tangible resources in the value-adding process (Spender, 1996). Taking this thinking a bit further, an entrepreneur or a particular firm does not need anything else than knowledge to secure the possession of the other resources that are needed to achieve competitive advantage. For instance, with a superior business model, which is based entirely on knowledge, an entrepreneur or a particular firm is able to get the funding that is required to access the other resources that are needed to kick-start a value-creation process. The recent developments in the global economy have provided evidence on this matter, as the world’s number one taxi firm does not own its cars, the largest accommodation provider does not own real estate, and the world’s most valuable retailer has zero inventory (Goodwin, 2015). Conversely, without a sound business model, the entrepreneur is likely to squander all the other resources due to the lack of purpose in its strategic value creation. This type of theorising – along with the recent examples – highlights the distinct role of knowledge-based and other intangible resources.

Summarising the discussion above, the RBV posits that competitive advantage is based on valuable, rare, inimitable and non-substitutable resources and especially on the firm’s capability to develop and deploy (i.e. manage) these resources. The KBV adds that knowledge is the firm’s most important resource and factor of production, and the capability to manage knowledge resources is the main factor of sustainable competitive advantage. As the RBV is one of the most discussed and influential management theories within the extant literature, it has also received its share of criticism. It has been for instance criticised for its lack of managerial implications (e.g. Priem and Butler, 2001;
Theoretical premises of the dissertation

Connor, 2002), applicability only on large firms (Connor, 2002) and poor definition of the term “resource” (Priem and Butler, 2001). The critique was combined and addressed in an article by Kraaijenbrink et al. (2010), which concluded that the future research should aim at better demarcating and definition of resources, clearer notion of resource value and switching the focus of analysis from firm performance potential into actual firm performance. This dissertation contributes to the RBV discussion by increasing understanding on how different (intangible) resources contribute to sustained competitive advantage, by offering a clearer distinction between capacity and action, and by providing empirical evidence on process-based approach regarding the RBV and firm performance.

In dealing with the firm’s knowledge issues, two separate academic discussions emerged that were later linked with the RBV and the KBV: namely, IC and KM practices. Regarding the link-up between IC, the RBV and the KBV literatures, it has been stated that IC is the primary resource of a firm that can be deployed to create competitive advantage (Tovstiga and Tulugurova, 2007), and that concepts and taxonomies related to IC demonstrate the central role of intangible resources in organizational innovation (Leitner, 2011). Also, it has been argued that a firm’s competitive advantage is explained with asymmetries of IC and an efficient utilization of it (Menor et al., 2007). Therefore, IC contributes to the KBV literature by operationalising and providing measures for the key intangible resources of the firm. KM practices, in turn, relate to the RBV and the KBV theories by discussing about the organizational and managerial practices which can be utilized to manage knowledge resources more effectively and efficiently (Andreeva and Kianto, 2012; Kianto et al., 2014). Thus, KM practices refer to actions and activities to leverage intangible resources to create competitive advantage. This study moves on next to discuss about IC and KM practices and their association with firm performance.

2.2 Intellectual capital

IC regards all the intangible resources including knowledge that a firm can leverage to create sustainable competitive advantage (Roos and Roos, 1997; Stewart, 1997; Sullivan, 1998). In particular, it assesses the role of intangible resources and knowledge as a catalyst of value creation and firm performance (e.g. Ricceri, 2008; Guthrie et al., 2012; Dumay, 2014), and focuses on improving management’s control over IC through improved identification, measurement and reporting of it (Mouritsen and Larsen, 2005). In order to establish a clear conceptual distinction between the firm’s resources and actions, this dissertation adopts the passive point-of-view wherein IC is seen as an asset. However, there are various alternative approaches that include also processes and capabilities as building blocks of IC (e.g. Spender, 2006; Edvinsson and Malone, 1997; Roos et al., 1998; Cañibano et al., 2002).

Typically, the overall IC of the firm has been measured with a tripartite model including human, structural/organisational and relational capital (e.g. Bontis, 1998; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1997) (Figure 2). Within this categorisation, human capital refers to knowledge, education, skills, capabilities and
2.2 Intellectual capital

characteristics of the firm’s employees (e.g. Bontis, 1998; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1997). The structural/organisational capital dimension regards basically all the other knowledge that is not embedded in humans or relationships, including documents, databases, process descriptions, plans, intellectual property and knowledge in information technology (IT) systems (Bontis, 1998; Edvinsson and Malone, 1997; Stewart, 1997). Finally, relational capital consists of the knowledge embedded in and derived from relationships with different stakeholders including customers, suppliers, distributors and partners (Edvinsson and Malone, 1997; Roos and Roos, 1997).

![Diagram of the emergent standard tripartite model of IC](image)

**Figure 2.** The emergent standard tripartite model of IC

Recently, the tripartite categorisation of IC has started to receive slight criticism for its suspected inability to grasp the whole variety of the key intangible value drivers of a modern firm (e.g. Kaufmann and Schneider, 2004; Kianto, 2007; Kianto et al., 2014). In addition to the trio of human, structural and relational capital, three novel IC dimensions – renewal capital (e.g. Kianto, 2008), trust capital (e.g. Mayer et al., 1995) and entrepreneurial capital (e.g. Erikson, 2002) – have started to gain researchers’ attention. In addition, it can be argued that examination of relational capital through separate internal and external dimensions is worthwhile, as they refer to value embedded in relationships with different stakeholders which have been demonstrated to contribute to firm performance in different fashion (e.g. Cassiman and Veugelers, 2006; see Figure 3). The inclusion of additional dimensions does not essentially expand the scope of the knowledge base of the firm that the tripartite model of IC has already managed to cover. Instead, the main development is to establish a more fine-grained division of the main
intangible assets of the firm in order to guide the discussion about the most important intangible value drivers of the firm.

Figure 3. The amplified seven-partite model of IC

Nowadays, the general tempo of the markets has entirely revolutionised the requirements for alertness, flexibility and renewal capability regarding the operating firms. In other words, a firm that is able to develop new knowledge, innovate and learn is also likely to be more agile to adapt into radically changing markets and secure its competitive position (Edvinsson and Malone, 1997). Therefore, a novel dimension of renewal capital should be included in the IC measurement model. Renewal capital regards the resources of the firm related to the innovation capability (e.g. Kianto, 2008) as well as the ability to renew through learning and creativity (e.g. Kianto et al., 2010). It links with the KBV especially through discussions on learning (e.g. Fiol and Lyles, 1985; Huber, 1991) and knowledge creation (Nonaka and Takeuchi, 1995). Renewal capital overlaps with the normative tripartite IC model. The majority of the innovation, creativity and learning potential resides in the organisational members (i.e. human capital), but it is also said to be connected with relational capital in terms of cooperation with the firm’s external stakeholders (i.e. open innovation) (e.g. Chesbrough, 2006; Huizingh, 2011). Also, the structural/organisational capital slightly overlaps with renewal capital through cultural artefacts and structural arrangements: thus, the renewal capital dimension should be studied as an independent construct of the firm’s overall IC, as it cannot be successfully
2.3 Knowledge management practices

KM regards the discussion on processes and practices of leveraging the firm’s knowledge base for enhanced firm performance (e.g. Alavi and Leidner, 2001; Davenport and Prusak, 1998; Heisig, 2009; Nonaka and Takeuchi, 1995; Von Krogh, 1998). Through the lens of the KBV, KM entails the capability to utilise and develop knowledge resources to create competitive advantage (e.g. Kogut and Zander, 1992; Grant, 1996; Spender, 1996). KM literature has discussed mainly about knowledge processes, such as knowledge acquisition, creation, sharing and utilisation (e.g. Andreeva and Kianto, 2011;
Chen et al., 2010; Ho, 2008; Hsiao et al., 2011; Lee et al., 2013). While this research avenue has tremendously advanced the discussion on the importance of knowledge-based issues in value creation, such as the mechanics of knowledge creation within an organisation (Nonaka and Takeuchi, 1995), its managerial contributions have been quite limited. The Achilles heel is, on one hand, that the research on knowledge processes has dealt with spontaneous knowledge-based activities that take place in firms even without conscious management control (e.g. Demarest, 1997; Husted and Michailova, 2002); therefore, the knowledge process research has struggled to produce continuous managerial impact. On the other hand, the vast majority of knowledge process research has replicated and empirically tested the same theoretical models year after year, without exploring new approaches to better understand knowledge-based value creation. A major factor of ambiguity within the KM literature has been the lack of recognition between processes and practices. An emerging literature stream of KM practices has introduced a novel knowledge-based discussion on the deliberate organisational and managerial activities (i.e. KM practices) that enable the firm to leverage its IC to create value (Kianto et al., 2014).

In addition to KM practices approach, IC management (ICM) is a quite similar discussion related to acquisition, development and utilisation of a firm’s intangible resources (Kujansivu and Lönnqvist, 2008). There are several frameworks related to ICM, including Intangible Assets Monitor that was one of the pioneering approaches to measure and present the firm’s intellectual assets by (Sveiby, 1997), the Meritum Guidelines (Cañibano et al., 2002) which focused on identification, measurement, control and reporting of intangibles, and the Danish Guidelines for intellectual capital statements (Mouritsen et al., 2003). The most distinct difference between the two approaches is that KM practices discussion is more concerned with identification and control of the firm’s IC through managerial practices, whereas several ICM frameworks highlight the importance of identification and reporting of IC.

Related to foundations of knowledge, knowledge taxonomies and knowledge processes, the approach of formal organisation for KM is under-researched (Foss et al., 2010). To address this research gap, some scholars have developed a research avenue of KM practices to discuss about the organisational and managerial practices that are integral to knowledge-based value creation. Because the topic is relatively new to management literature, there are no established theoretical models of KM practices available. In order to mention some suggestions of the key KM practiced focus areas, a combination of HRM and information communication technology (ICT) has been identified as one that is likely to exist in the majority of firms (Andreeva and Kianto, 2012). A more recent suggestion is set to cover a wider spectrum of KM practices within a firm, including structural arrangements, setting a KM-friendly culture, ICT practices, learning mechanisms, knowledge-based HRM practices and knowledge protection (Kianto et al., 2014). Based on these pioneering articles, a ten-dimensional measurement model of KM practices is proposed in this study. This overarching categorisation includes supervisory work, knowledge protection, strategic KM, learning mechanisms, IT practices, work organising,
and four dimensions of HRM practices, including knowledge-based recruiting, training and development, performance appraisal and compensation practices (Figure 4).

DeTienne et al. (2004) wrote that supervisory work is a critical success factor of KM, as leaders are seen as natural example-setters that are needed at the helm of the KM agenda to push it ahead throughout the entire organisation. Therefore, the qualities and behaviour of KM leaders set the tone for the success of the KM initiative. Among the desired skills and capabilities are an inspirational approach, mentoring skills, example-setting (for e.g. knowledge sharing), establishing a vision, listening, learning, teaching and the capability to establish a trustful and respectful working environment (Holsapple and Singh, 2001).
Strategic KM regards identifying the strategic knowledge of the firm, measuring and monitoring the strategic knowledge resources, and developing a KM strategy as well as implementing and updating activities related to it (e.g. Dalkir, 2005; Kianto, 2008; McKeen et al., 2005; Skyrme and Amidon, 1997; Zack, 1999a). These strategic KM practices enable firms to recognise their strategically most significant knowledge and gain competitive advantage by leveraging it (Barney, 1991; Conner and Prahalad, 1996; Grant, 1996). Also, the recognising, measuring and monitoring practices keep the firms up-to-date on their knowledge bases, which helps them to allocate, utilise, expand and share them according to the firm’s strategic aims (Zack, 1999b; Von Krogh et al., 2001).

Knowledge protection relates to strategic KM as it regards protection of the strategically valuable knowledge resources. The basic tenet of knowledge protection is appropriability, which stands for the firm’s ability to secure the created value for its own benefit (Kay, 1995); thus, protecting the strategic knowledge from leaking out to the hands of potential imitators is a key issue for ensuring profitability through appropriability (Teece, 1998). Knowledge protection increases the likeliness of knowledge-based competitive advantage, which makes it a key capability within the KBV. The diversity of organisational knowledge requires both formal and informal means of knowledge protection, such as non-disclosure agreements and licensing agreements, respectively (Olander, 2011).

HRM refers to the management of the organisation’s employees (Foot and Hook, 2008). Its objective is to recruit employees, allocate tasks, monitor the employee performance and offer rewards (Tichy et al., 1982). Researchers have widely suggested that HRM is a key success factor for KM, as it enables directing employee efforts towards the common strategic goals of the firm (Hislop, 2003; Scarbrough, 2003; Wong, 2005). Opposing the traditional approach to bundle several HRM practices into one unit, this study examines four HRM practices (i.e. knowledge-based recruiting, training and development, performance appraisal and compensation) separately in an attempt to produce more accurate managerial implications. Knowledge-based recruiting pays attention to the candidate’s relevant expertise, learning and development potential, as well as social skills. These sort of abilities are likely to have a positive effect on performance in knowledge-intensive tasks (Chen and Huang, 2009; Currie and Kerrin, 2003; Scarbrough, 2003).

Training and development regards a pro-active planning and implementation of courses, seminars and training programs with an aim to increase the value and volume of the firm’s knowledge base, for instance through knowledge internalisation, wherein the learnt explicit knowledge increases the individual’s capability to understand and reflect (Nonaka and Takeuchi, 1995). The role of the human resources (HR) department and manager is this regard is to stay alert to assess and examine the need for new skills and competences (Senge, 1994). These needs could arise for instance from changing industry standards, customer preferences or staff ambition to grow as professionals.

Performance appraisals based on knowledge activities differ from the conventional employee performance review and career development session. Knowledge-based
2.3 Knowledge management practices

Performance appraisal focuses exclusively on how an employee has performed in regard to knowledge sharing, knowledge creation and application of knowledge acquired from others. This approach highlights the significance of the KM agenda within a firm and outlines the strategic need for activity in terms of these knowledge processes. Consequently, the perceived importance is likely to increase the employee engagement with these activities.

The fourth and final HRM practice discussed in this study is knowledge-based compensation. As with knowledge-based performance appraisals, the objective is to compensate employees for their activity in knowledge sharing, creation and utilisation. There has been debate over the usefulness of monetary compensation in KM, but the proponents have argued that firms must find ways to motivate employees to contribute to knowledge leverage (e.g. Mohrman et al., 2002).

Learning is a key facet of the KBV (see Fiol and Lyles, 1985; Huber, 1991). Learning mechanisms for bolstering the firm’s knowledge base relate to both learning-by-doing and learning from others (Gherardi, 2009; Lave, 2009). In practice, mentoring programs embody the first approach, whereas collection and utilisation of best practices relate to the latter style. These learning practices facilitate access to the firm’s collective knowledge base, and enable systemic development and utilisation of it through coordinated knowledge dissemination and sharing.

One of the major changes globally during the past two decades has been the digital revolution (e.g. Collins and Halverson, 2009). It has had a major effect on production technologies, products and services, and means of communication, as well as enabling access to vast information resources and the related information analysis (e.g. Kankanhalli et al., 2003). During the transition, offices and even entire organisations have adopted technological support including intranets, electronic document and records management, digital archiving, databases, virtual conferencing, business intelligence tools for more timely and informed decision-making, and even overarching KM systems or portals to provide a backbone of technology support for KM. Depending on the point-of-view, technology relates to the KBV as a valuable resource (Edvinsson and Malone, 1997; see also Heisig, 2009) or as a capability and practice to utilise the technology support to leverage the firm’s knowledge resources (e.g. Alavi and Leidner, 2001; Andreeva and Kianto, 2012; Castro et al., 2013; Davenport and Prusak, 1998; Kianto et al., 2014). In this study, the latter approach is adopted, while technology-as-a-resource is embedded within the structural capital dimension.

Finally, work organising practices deal primarily with organisational design issues. The aim of these issues is to facilitate the leverage of IC within a firm through coordination of work and division of work and responsibilities (Mintzberg, 1992), and to establish knowledge communities for knowledge expansion and creativity (e.g. Wenger, 1999). The extant KM literature has suggested that decentralisation of power to capable knowledge workers accelerates processes and decision-making within a firm, which has
positive impacts to the development of unique knowledge (i.e. innovations) (Davenport and Prusak, 1998).

2.4 IC, KM practices and firm performance

Firm performance is nowadays increasingly reliant on the intangible resources of the firm that can be labelled as IC (e.g. Drucker, 1993; Edvinsson and Malone, 1997; Stewart, 1997; Sveiby, 1997). According to the literature, IC dimensions tend to create value especially when they are combined together (e.g. Bontis, 1998; Roos et al., 2001; Marr et al., 2004).

The most conventional strategy to operationalise IC is the tripartite model including human, structural/organisational and relational capital (e.g. Bontis, 1998; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1997). Quite a popular argument among scholars is that human capital is the most important resource for a firm as it constitutes the very base of overall IC of a firm (Chen et al., 2004). Also, it tends to increase the level of other IC dimensions; for example, intelligent employees accumulate the stock of structural capital over time (F-Jardón and Martos, 2009; Jardon and Martos, 2012). Human capital is also the resource capable of thinking (Marr, 2006), so its input is needed related to strategic decisions that influence the competitiveness of the firm. From another point-of-view, some have argued that relational capital is the most decisive IC dimension for the sake of firm performance because it is needed to cash in the investments devoted to development of human and structural capital (Bozbura, 2004). Also, in can be intuitively posited that structural/organisational capital can be seen as the strategically most important IC dimension because it is firm-specific, it can be almost endlessly combined with other resources to create new VRIN-attributed knowledge resources and it bears a small risk-factor compared to human capital turnover and sensitive relationships which could lead to dramatic knowledge leaks and losses.

While these three IC dimensions have operationalised the human-oriented, organisation-oriented and relationship-oriented aspects of the firm’s knowledge base, they do not give enough credit for other key intangible value-creating resources, such as the firm’s capability to renew, the importance of the trait of trust in relationships and entrepreneurial activities and approaches within a firm. Therefore, renewal capital (e.g. Kianto, 2008), trust capital (e.g. Mayer et al., 1995) and entrepreneurial capital (e.g. Erikson, 2002) should be considered as parts of the overall IC of the firm. Also, relational capital should be studied as two separate dimensions related to internal and external relational capital dimensions, as they deal with value embedded in and derived from relationships with different stakeholders (e.g. Cassiman and Veugelers, 2006). Empirical examination of this amplified IC model will provide more detailed information about what sort of knowledge really matters for competitiveness.

Renewal capital influences the firm’s innovation capability (e.g. Kianto, 2008). Therefore, it is likely to be a strategically valuable source of sustained competitive advantage. Firms high in renewal capital are characterised by their learning and creativity
(e.g. Kianto et al., 2010), which have been profoundly discussed within the KVB literature as key capabilities (e.g. Fiol and Lyles, 1985; Huber, 1991; Nonaka and Takeuchi, 1995). Trust capital adds value to internal and external relationships (e.g. Mayer et al., 1995), as it significantly increases knowledge sharing and creation (Nahapiet and Ghoshal, 1998). Trust between individuals and organisations develops over time and actions, which makes it a unique and inimitable source of competitive advantage (Boxall and Purcell, 2011). Entrepreneurial capital increases the efficiency of the firm by enabling more self-determining activities in the firm (Dess et al., 1997; Hughes and Morgan, 2007). It also can be seen to be a factor of competitive advantage in terms of the risk-taking ability (Cesaroni et al., 2015; Lumpkin and Dess, 1996), pro-activeness and aggressive decision-making (Lumpkin and Dess, 1996) as they increase the opportunities to gain above average returns through e.g. first mover advantage.

The basic mechanism of knowledge-based value creation is that knowledge resources are converted into products or services (Amit and Schoemaker, 1993). This conversion requires various types of knowledge resources, as well as knowledge to use (e.g. combine) and develop them (Grant, 1996; Kogut and Zander, 1992; Spender and Grant, 1996). The discussion on KM practices relates to the action-oriented resource manipulation and management aspect within the KBV. It identifies the key organisational and managerial practices that are required to unleash the intellectual potential and derive firm performance benefits out of the firm’s IC. Before the recently commenced discussion on KM practices, numerous alternative frameworks were developed to examine how firms could efficiently create economic value out of IC. Among those frameworks, the Knowledge Asset Value Spiral focused on identifying the key knowledge assets of a firm and understanding their role in value delivering dynamics (Carlucci and Schiuma, 2006), the Knowledge Value Chain suggested a conceptual framework wherein business performance was a projected outcome of IC and knowledge processes (Carlucci et al., 2004), and Value Chain Scoreboard by Lev (2001) was established to identify the processes by which intangibles create economic value for a firm. In addition, Kujansivu and Lönnqvist (2008) demonstrated the feasibility of carrying out ICM in practice by combining it with some other management practices, instead of adopting a specific ICM framework.

Yet there has not been much discussion specifically about the KM practices among the extant literature. However, KM practices overlap with such research domains as HRM, organisational learning and knowledge protection, which have been subject to vibrant discussion. Referring to the set of KM practices that was introduced earlier within this dissertation, each practice can be theorised either to directly influence firm performance or to interact with IC dimensions to affect the knowledge base of the firm. For instance, the role of supervisory work within knowledge-intensive firms is to establish a creative organisational culture that cherishes values such as trust and respect (Holsapple and Singh, 2001). It has potential to influence firm performance through installing a creative and innovative spark within the firm, as well as motivating and guiding the employees to be the best versions of themselves. Strategic KM, in turn, enables firms to identify their most significant knowledge resources and leverage them to achieve competitive
advantage (Barney, 1991; Conner and Prahalad, 1996; Grant, 1996). Further, knowledge protection is a necessary practice for the firms that are able to generate valuable knowledge and want to share or use it for innovation and final outcomes. Through knowledge protection practices, these firms are able to secure economic benefits from what they have been able to create and innovate (Kay, 1995). HRM practices are also critical firm performance drivers because, in the IC-perspective, they deal arguably with the most significant resource of the firm, by acquiring, developing and utilising human capital. Fundamentally, HRM practices are effective means to direct the employees’ efforts towards the general strategic goals of the firm (Hislop, 2003; Scarbrough, 2003; Wong, 2005). One of the key aspects of the firm’s learning orientation that leads to innovation and improved firm performance outcomes is intra-organisational knowledge sharing (Calantone et al., 2012). The collection and utilisation of best practices and mentoring programs are such knowledge-sharing practices and learning mechanisms that enable better decision-making, make a firm more efficient and increase the value of the knowledge base, as they diminish the probability for repeating mistakes and re-inventing the wheel phenomenon, increase the adoption of workable solutions, and provide a tool for tacit knowledge sharing. Utilisation of IT practices improves the leverage of IC and therefore is a valuable capability for a modern firm (Alavi and Leidner, 2001; Davenport and Prusak, 1998). Some of the IT practices, such as taking advantage of the new ways of communication and electronic document management, could be deemed as ones that do not necessarily provide competitive advantage but rather are prerequisites to keep up with rivals and a turbulent business environment. On the other hand, there are also many potentially prosperous ways of utilising IT practices related to e.g. business intelligence and data mining (e.g. Tan et al., 2005; Surma, 2011). Finally, work organising is an approach that enables firms to leverage their IC by creating settings for employee participation in decision-making, informal communication, professional knowledge communities and cross-functional cooperation. Power distribution has been argued to accelerate processes and decision-making within a firm (Davenport and Prusak, 1998). Knowledge communities expand the firm’s knowledge base and provide solutions to improve various aspects of work (Wenger, 1999), while the cross-functional mode of working has been touted as beneficial for innovation performance (Luca and Atuahene-Gima, 2007) and new product development (Song and Parry, 1997).

2.5 The relationship between IC and KM practices

IC and KM literature streams have been developed separately into distinct research avenues, which have been recently linked to the RBV and the KBV discussions. IC is concerned mainly with operationalising and measuring the intangible resources (i.e. knowledge) of the firm (Dumay, 2014; Guthrie et al., 2012; Mouritsen and Larsen, 2005; Ricceri, 2008), whereas KM research regards the practices and processes of leveraging on the knowledge resources (e.g. Alavi and Leidner, 2001; Davenport and Prusak, 1998; Heisig, 2009; Nonaka and Takeuchi, 1995; Von Krogh, 1998). Through the lens of the KBV framework, this study posits that the overall IC of the firm represents the key
2.5 The relationship between IC and KM practices

strategic knowledge resources of the firm, whereas KM practices regard a selection of organisational and managerial practices that can be used to create competitive advantage.

Some scholars have recently started to examine the relationship between IC and KM (e.g. Hsu and Sabherwal, 2011; Kianto et al., 2014; Seleim and Khalil, 2011). Kianto et al. (2014) demonstrated four different options of how IC and KM practices could be associated with organisational performance (Figure 5). The authors specified that the most likely option was a model wherein KM practices moderated the effect of IC on organisational performance outcomes. This option basically rephrases the core message of the KBV, which states that a firm’s competitiveness is based on its knowledge base; however, capabilities to utilise and develop it are also needed to transform resources into competitive advantage (e.g. Kogut and Zander, 1992; Grant, 1996; Spender, 1996). For instance, human capital can be leveraged by utilising HRM practices and structural capital (e.g. systems, documents, databases) can be utilised and developed through IT practices (Kianto et al., 2014). Another moderator model by Kianto and others swaps the roles of IC and KM practices to theorise that the amount of available IC positively moderates the effect of the used KM practices on organisational performance. The two further options by Kianto and others deal with mediator models. These options indicate that utilisation of KM practices increases the amount of overall IC of the firm, which leads to improved organisational performance, or that the possessed amount of IC increases the utilisation level of KM practices which is likely to lead to improved firm performance outcomes. All these presented options intuitively make sense, but it is highly probable that the reality of coexistence of IC and KM practices is a combination of all four suggested options.
Empirical literature has provided some backing for Kianto et al. (2014). For instance, Hsu and Sabherwal (2011) suggested that IC facilitates knowledge processes (knowledge application, conversion and acquisition), which are among the main facilitators of innovation (alongside dynamic capabilities and learning culture) and firm performance. This suggestion refers to the mediating effect of KM between IC and firm performance outcomes. Also, Seleim and Khalil (2011) argued that the relationship between IC and knowledge processes is a complex one, consisting of both one-way and two-way influencing patterns between them. In a more detailed description, Seleim and Khalil (2011) stated that knowledge acquisition, creation and application were likely to increase organisational capital, while knowledge application also tend to increase human capital. The authors also suggested that a variation in the level of human capital was associated with variation in knowledge acquisition and transfer, while the level of organisational capital influenced the level of knowledge transfer. In turn, the two-way influence related to reciprocity between knowledge documentation and organisational capital, as well as between knowledge transfer and relational capital. Despite these efforts, only a few known studies have tried to merge the IC and KM practice landscapes to analyse how knowledge issues and firm performance are linked. Moreover, these papers have typically
focused on only one or a few IC dimensions and KM practice categories (e.g. Cabello-Medina et al., 2011; Youndt and Snell, 2004; Yang and Lin, 2009).

In light of the dual message of the KBV, wherein both knowledge base and the capabilities to use and develop it are needed to achieve sustainable benefits (e.g. Grant, 1996, Spender, 1996), it is quite surprising that the approach to merge IC and KM practice discussions has been established only recently. The bottom line, however, is that they should be researched together as there is synergy potential to increase understanding about the optimal knowledge base of the firm and what managerial and organisational activities are needed to derive firm performance benefits.
3 Methodology

This part of the paper discusses about the methodological selections of this dissertation, data collection and data analysis. As the data for this study was collected by means of a structured survey, this section also reflects on the development of the survey instrument. The research design of this dissertation consisted of two methods: The first two articles were systematic literature reviews, whereas the three remaining papers approached their research questions with quantitative research techniques. A combination of research methods was selected, as there was a need to recap the previous literature on IC and KM practice in order to establish overall understanding of the phenomenon, as well as to empirically test the novel conceptual models of IC, KM practices and firm performance.

3.1 Methodological considerations

The objective of this dissertation was to increase understanding on causality between IC, KM practices and firm performance, so its falls under a paradigm that is labelled as positivism or logical positivism (Godfrey-Smith, 2009). Positivism is a mainstream philosophical stance within the academic management literature (Eriksson and Kovalainen, 2008) which essentially views reality as objective and reasonable (Sohn and Berry, 2006). Logical positivism is based on empiricism which means that researcher has to gain knowledge through observation or experience (Macionis and Gerber, 2011). Empirical research can be either quantitative or qualitative. A quantitative approach was adopted in the study as it simultaneously facilitated examination of the newly-developed conceptual model through experimentation and rigorous testing, and enabled generalisability and dissemination of the research results for the benefit of as large audience as possible. While the result generalisation aspect should not be deemed as valuable by default, it can be argued that verification or falsification of new theoretical model, such as the amplified IC model and new the KM practices model in this study, benefitted from the use of large sample of quantitative data and generalisability of the findings related to the phenomena.

Another options would have been to conduct an entirely qualitative empirical study or to combine qualitative and quantitative approaches. The research question of this dissertation would have permitted utilisation of qualitative research strategy, because it would have enabled examination of firm-specific resources and capabilities and their influence over firm performance, which is in the focal point of the RBV and the KBV discussions. Having said that, the quantitative approach was preferred over other options during this stage, because it enables knowledge production through valid and reliable measurement methods, a more rigorous theory testing and generalisability of the research results (Churchill, 1979). Furthermore, two systematic literature reviews were conducted in order to establish a state-of-the-art understanding of the associations between IC, KM practices and firm performance, and to permit contrasting point-of-view between the extant literature and the results of the empirical part of this dissertation.
3.2 Systematic literature review

In order to summarise the literature relevant to the first two research questions, two extensive systematic literature reviews were conducted. A systematic literature review was organised around a research question, with the aim to recap the current state of understanding of the association between IC, KM practices and firm performance outcomes. A systematic review procedure, inspired by Bakker (2010), Crossan and Apaydin (2010), and Tranfield et al. (2003), was selected because of its replicability and transparency, as well as the structure it provides for the literature selection processes (Figure 6).

For both literature reviews, the abstract and citation database Scopus (http://www.elsevier.com/online-tools/scopus) was used to find the relevant body of literature. Scopus was selected because of its perceived searching accuracy and wide
3.2 Systematic literature review

coverage of academic literature (Falagas et al., 2008). The searches within the database were targeted only at the subject area of “Business, Management and Accounting” because the literature under that category was judged to showcase a relatively high managerial approach. Also, only peer-reviewed journal publications written in English were included to ensure the minimum quality of the articles and also the transparency and replicability of the two systematic literature strategies. After the initial search for literature, the lists of potentially relevant articles were migrated to the online bibliographic management program RefWorks (https://www.refworks.com/) to set up a personal working database for the later stages of the literature selection processes.

The first review included only empirical papers with quantitative research strategies, as they were expected to contribute the most substantial evidence to answer the sub-question about the current understanding on the association between intellectual capital dimensions and firm performance outcomes. Articles that had utilised secondary data or an accounting perspective were excluded for their alleged inability to grasp the IC phenomenon as conceptualised in this study (Ståhle et al., 2011). Case studies were excluded because of their tendency to deal especially with the standout firms. In order to ensure sufficient coverage of the targeted literature, only one search term, “intellectual capital”, was used, and the search produced 1721 unique hits. As it was expected, the shortlist after the initial search included mostly articles that did not fulfil the inclusion criteria. Gradually, after the limitations based on the title, abstract and full-text, the number of relevant articles was reduced to 47. After the snowballing from the reference lists of the remaining publications, the final shortlist of the relevant articles stood at 54.

The literature selection for the second literature review was quite a bit more complicated because the terminology regarding the focus area of KM practices had not been established. Another challenge was that the relevant literature was expected to overlap with various areas of research (Ragab and Arisha, 2013) and expected to have been published in numerous non-KM journals (Ma and Yu, 2010). In order to gather together the relevant literature on KM practices and answer the sub-question on the association between KM practices and firm performance, the following search terms were used in the literature search: “knowledge management” AND “questionnaire”, “knowledge management” AND “survey”, “knowledge management” AND “performance”, and “knowledge management” AND “case study”. As this list shows, this review did not exclude case studies in the literature selection process because the novelty of the research topic demands a thorough review to formulate a solid base for understanding the phenomenon. The initial search within the database produced 2221 potentially relevant articles. After studying the titles, abstracts and full-texts, the sample of relevant articles was reduced to 30. After the snowballing from the reference list of the remaining articles, the final number of the included papers was 32.

3.2.1 Reliability and validity

The existence of bias related to literature selection potentially undermines the validity and reliability of a systematic literature review. In this study, the systematic literature
review procedure aimed at minimising the bias by utilising objective approaches in literature selection and review. Also, the entire process walkthrough was transparently showcased to increase replicability. A high quality of the reviewed publications is also one of the key issues for a relevant and impactful literature review. This point was addressed by including only peer-reviewed journal papers within the two reviews. The quality of the systematic reviews was further warranted by including a sufficient number of articles to form a representative sample of literature related to each research question.

### 3.2.2 Methodological issues

Even though the systematic review procedure aims to minimise the bias by being organised and transparent, there is always room for the reviewer’s personal preferences. Starting from the development of the search terms, the reviewer is able to affect the outcome of the literature search, which again influences every later stage of the review procedure. Further, during the limitation based on titles, abstracts and full-texts, all the decisions concerning inclusions and exclusions, even though based on the exclusively stated pre-defined criteria, are eventually executed on the premises of the reviewer’s preference, expertise, and ongoing learning during the process. In summary, it is very likely that two experts within the same research area would come up with slightly different shortlists of the articles relevant to the research question, even if they utilised the same search terms and databases.

### 3.3 Survey research

A quantitative approach with a survey research strategy was considered as the most suitable for the empirical measurement of constructs and rigorous testing of the developed theoretical model of IC, KM practices and firm performance. The articles that elaborated the verification or falsification of conceptual models related to IC, KM practices and firm performance were dependent on hypothesis testing and solid measurement of constructs. (e.g. Churchill, 1979; 1992).

#### 3.3.1 Sampling and data collection

The data was collected from a cross-industrial sample of Finnish firms in 2013 by means of a structured survey. Only firms with over 100 employees were included in the scope. A total of 1523 companies were identified to fulfil that criteria. These firms were contacted by phone, and the person in charge of the human resources was requested to participate to the survey; therefore, a key-informant technique was utilised. Eventually, 262 usable responses were received, representing a response rate of 17.2%. The data with 262 responses was utilised in the third publication of this dissertation: “Intellectual capital and performance – Empirical findings from Finnish firms”. In the later publications “Knowledge management practices and innovation performance in Finland” (IV) and “Intellectual capital, knowledge management practices and firm performance” (V), a dataset consisting of 259 responses was used. Three responses had to be removed out as
the three associated firms no longer fulfilled the criteria of employing 100 or more employees (information based on 2013 annual reports). The response rate for the sample of 259 responses was 17.0%.

Most of the responses were received from the manufacturing sector (37.8%), followed by wholesale and retail trade (16.2%), services (9.7%) and transportation and storage (8.1%). Based on these figures, manufacturing was slightly over-represented and services under-represented compared to the entire population of the Finnish firms, as these industries constitute 29.8% and 13.5% of the entire population. Related to the size of the firm, the 100-200 employee firms formed the largest group of the respondents (39.8%), followed by 250-500 employee firms (20.0%), and 500-1000 employee firms (9.0%); finally, the smallest group had more than 1000 employees (8.0%). The respondents held positions as HRM directors or managers (77.9%), other directors or managers (8.8%) or managing director (6.9%).

3.3.2 Measures

When applicable, the measures for the theoretical constructs were adopted from the existing literature sources that had previously validated them, following the suggestion by Churchill (1979; 1992). Entire validated and tested scales were preferred, but also single survey items were adopted. The utilisation of the validated measures increased the likeliness to achieve high quality data for this study. In addition, such measures were judged to offer a higher contribution to the existing literature due to the comparable and uniform measures.

Despite the preference to replicate previously validated measures, some items and entire scales for the more novel constructs of IC and KM practices had to be developed. In order to minimise the measurement error, the studied concepts were operationalised with multi-item Likert-type scales (Churchill, 1979, 1992; Malhotra and Grover, 1998). The scales and related literature sources are presented in Table 1, while the development of the scales is further discussed in Section 3.3.
Table 1. The scales used in this study

<table>
<thead>
<tr>
<th>Concept</th>
<th>Previously appeared or discussed in</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intellectual capital</strong></td>
<td></td>
</tr>
<tr>
<td>Human capital</td>
<td>Bontis (1998); Yang and Lin (2009)</td>
</tr>
<tr>
<td>Structural capital</td>
<td>Kianto (2008); Kianto et al. (2010)</td>
</tr>
<tr>
<td>Internal relational capital</td>
<td>Kianto (2008); Yang and Lin (2009)</td>
</tr>
<tr>
<td>External relational capital</td>
<td>Kianto (2008)</td>
</tr>
<tr>
<td>Trust capital</td>
<td>Mayer et al. (1995); Vanhala et al. (2011)</td>
</tr>
<tr>
<td>Entrepreneurial capital</td>
<td>Hughes and Morgan (2007)</td>
</tr>
</tbody>
</table>

**Knowledge management practices**

<table>
<thead>
<tr>
<th>Supervisory work</th>
<th>A self-developed scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic KM</td>
<td>McKeen et al. (2005); Kianto et al. (2014); Boumarafi and Jabnoun (2008)</td>
</tr>
<tr>
<td>Knowledge protection</td>
<td>Levin et al. (1987); Cohen et al. (2000); Hurmelinna-Laukkanen and Puimalainen (2007); Hurmelinna-Laukkanen and Ritala (2012); Lawson et al. (2012)</td>
</tr>
<tr>
<td>Knowledge-based recruiting</td>
<td>Yang and Lin (2009); Cabello-Medina et al. (2011)</td>
</tr>
<tr>
<td>Knowledge-based training and development</td>
<td>A self-developed scale</td>
</tr>
<tr>
<td>Knowledge-based performance appraisals</td>
<td>Andreeva and Kianto (2012)</td>
</tr>
<tr>
<td>Knowledge-based compensation</td>
<td>Andreeva and Kianto (2012)</td>
</tr>
<tr>
<td>Learning mechanisms</td>
<td>Becerra-Fernandez and Sabherwal (2001)</td>
</tr>
<tr>
<td>IT practices</td>
<td>Handzic (2011); Negash (2004); Pirritimäki (2007)</td>
</tr>
<tr>
<td>Work organising</td>
<td>A self-developed scale</td>
</tr>
</tbody>
</table>

3.3.3 Reliability and validity

The data relied on self-report measures, which might have biased the findings in terms of common method variance. Literature suggests that common method bias (CMB) can be a particular concern when a single respondent is requested to fill out the items that cover
both independent and dependent variables (e.g. Spector, 2006; Rindfleisch et al., 2008). Following the instances from past research (e.g. Minbaeva et al., 2012; Vaccaro et al., 2012), several measures were taken to reduce the risk of CMB. First of all, the respondents’ likeliness to alter their answers due to expectations of others was managed by assuring the respondent of confidentiality within the design and administration phases of the survey (see Minbaeva et al., 2012; Tsai and Ghoshal, 1998). Second, the quality of the scale items was gradually improved in collaboration with managers in order to clean-up the grammar and establish a compact survey (MacKenzie and Podsakoff, 2012). In addition, a panel of IC and KM experts was consulted to increase the concreteness of the constructs, which further decreased the risk of CMB (e.g. Rindfleisch et al., 2008; MacKenzie and Podsakoff, 2012). Moreover, the possibility of CMB was reduced by anchoring the subjective scales for IC, KMP and performance measures (e.g. Podsakoff et al, 2003; Rindfleisch et al., 2008; MacKenzie and Podsakoff, 2012).

After the data collection, the risk of bias was assessed by Harman’s one-factor test (Podsakoff et al., 2003). Principal component analysis, including all the items from all the constructs, was conducted to determine the number of factors that was needed to account for the variance of all the items. The seven factors related to IC accounted for 65.6% of the total variance, and the largest factor (32.6%) did not account for the majority of the variance; thus, CMB was not a concern for the IC construct. In terms of KM practices, the ten factors accounted for 69.6% of the total variance, while the largest factor account for 32.2%; as a result, CMB was not a concern for KM practices construct either.

### 3.3.4 Methodological issues

In this sort of survey research strategy that relies on self-reported measures, it would be good to have multiple respondents per firm. For instance, it would have added value to the research design if the performance data was gathered from managers responsible of the firms’ financial issues. However, that approach was not feasible as the focus was on gathering as much data from as many companies as possible, and the requirement for multiple respondents per firm would have increased the risk of a low response rate. Another option would have been to collect the firm performance data from objective sources, such as public company databases. However, utilisation of both innovation and market performance as firm performance measures set insurmountable barriers for utilising the objective sources of data. First, it is very difficult to obtain reliable objective performance data related to innovations. Oftentimes the number of patents is used as an indicator of innovation performance, but it is not equally relevant for all industry sectors that were studied. Also, as some previous studies have suggested, the measures of perceived performance tend to produce data that is in line with the objective measures (e.g. Dess and Robinson, 1984; Delaney and Huselid, 1996); thus, even though the use of subjective performance data may increase measurement error and risk of potential mono-method bias (Delaney and Huselid, 1996), its use is considered as a viable option when coupled with a high-quality research design (Minbaeva et al., 2012).
Moreover, this dissertation has its theoretical basis on the RBV and the KBV, which both argue that competitive advantage accrues from possession and deployment of valuable resources; therefore, it was purposeful to measure each responding firm's success in relation to its competitors over the past year. That was accomplished by utilising a subjective performance measurement scale on the firm’s market performance.

Another potential measuring-related issue is that survey research strategy might not be always the best available approach to examine firm-level IC and KM practices. If there was an overarching, replicable and reliable mean to adopt objective IC figures from sources such as publicly available databases or annual reports, it should be the standard way to collect data for the purposes of academic research, because it would secure a high quality and transparency of the data. However, such attempts (e.g. the Value Added Intellectual Coefficient and the Calculated Intangible Value; see Pulic, 2000; Stewart, 1997) have been so far judged to have a little to do with IC (e.g. Ståhle et al., 2011). A critical issue in IC and KM measurement is the ability to grasp the firm's tacit knowledge, which is type of knowledge that is not codified (e.g. Polanyi, 1966) or can be codified only marginally (e.g. Nonaka and Takeuchi, 1995). It has been argued that the socially complex tacit knowledge is the most valuable type of knowledge and source of sustained competitive advantage (Barney, 1991). Because of the challenges in terms of codification, tacit knowledge cannot be, within the limits of the available approaches, thoroughly quantified nor reported; therefore, researchers have widely adopted survey strategy and face-to-face interviews in order to attain knowledge about it. Survey approach is more capable of shedding light on the general characteristics of a phenomenon, whereas the outcome of the case interviews is oftentimes more case-specific. Interviews would have probably yielded valuable knowledge about the firms’ motives to manage their IC resources and how they do it, answering questions why and how (Denzin and Lincoln, 2011). That knowledge would have complemented the survey data very nicely, and for that reason the lack of interview data should be discussed as a limitation of this dissertation.

### 3.4 Development of the survey instrument

The survey development was an iterative process. It was conducted by a group of four researchers in a 2013 Lappeenranta University of Technology research project entitled “Intellectual Capital and Value Creation”. During the first stage of the development process, the previous IC and KM literature was reviewed to gain overall understanding of the phenomenon and to find existing IC- and KM-related surveys that had been validated in empirical studies. A conceptual model on the hypothesised relationships between IC, KM practice and firm performance was developed based on the reviewed literature.

In the second stage, the constructs in the conceptual model were operationalised as a survey instrument. The surveys that were found during the literature review were gathered, compared, evaluated and analysed to determine whether they formed a good fit
3.4 Development of the survey instrument

with the purposes of the project and this dissertation. Within this stage, nearly all IC constructs were covered with relevant measures. For instance, the human capital scale was based on the articles from Bontis (1998) and Yang and Lin (2009), structural capital was adopted from Kianto (2008) and Kianto et al. (2010), external relational capital was also adopted from Kianto (2008) and internal relational capital was based on Kianto (2008) and Yang and Lin (2009). Regarding the novel IC dimensions, the renewal capital scale was influenced by Hughes and Morgan (2007), Kianto et al. (2010) and García-Morales et al. (2006), while the entrepreneurial capital scale was based on Hughes and Morgan (2007). Regarding the KM practices measures, the knowledge protection scale was fully 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). Further, the scale for market performance was adopted from Delaney and Huselid (1996) and a scale for innovation performance from Weerawardena (2003). In both of these firm performance measurement scales, the respondents were requested to compare their firm’s success to the competitors’ All of the measures were five-point Likert-type scales (1 = strongly disagree, 5 = strongly agree).

In the third stage, the remaining blank parts were filled with measures inspired by the reviewed literature, but they were either partly or entirely self-developed. This was done in several intensive brainstorming sessions, wherein the items were developed based on the gained theoretical understanding of the IC and KM practices. The trust capital scale was quite extensively re-developed based on the ideas by Mayer et al. (1995) and Vanhala et al. (2011). The development of the strategic KM scale was inspired by McKeen et al. (2005), Kianto et al. (2014) and Boumaraf and Jabnoun (2008), the recruitment scale by Yang and Lin (2009) and Cabello-Medina et al. (2011), the performance appraisal scale by Andreeva and Kianto (2012), the compensation scale by Andreeva and Kianto (2012), the learning mechanisms scale by Becerra-Fernandez and Sabherwal (2001) and the IT practices scale by Handzic (2011), Negash (2004) and Pirttimäki (2007). Further the scale on supervisory work, the training and development scale, and the work organisation scale were entirely self-developed. Also, all of the above-mentioned measures were five-point Likert-type scales (1 = strongly disagree, 5 = strongly agree). At this point of the survey development process, IC measures consisted of 26 items, KM practices of 60 items, market performance of 4 items and innovation performance of 4 items.

In the fourth stage, the content validity of the survey was evaluated by several international and domestic IC and KM experts, who had a chance to give comments and suggest modifications. They were especially requested to assess if the survey managed to cover all the relevant aspects of IC and KM practices. The first round of the comments was collected from international colleagues who had backgrounds in the IC or KM research domains, and from the steering group of the “Intellectual Capital and Value Creation” project at the Finnish Funding Agency for Innovation (Tekes) (http://www.tekes.fi/en/tekes/). These experts showcased the necessary understanding of IC and KM in order to provide valuable input on the measurement issues. After following the recommendation to use available expertise to evaluate the measures before starting data collection (e.g. Hinkin, 1998; DeVellis, 2003), the comments were addressed and
the necessary modifications were carried out. Then, the survey was translated into Finnish, and the content validity was further addressed by the members of Finnish Information Specialists (http://www.tietoasiantuntijat.fi). Internal consistencies of the developed scales were tested with a sample of 21 responses, which prompted the deletion of some items. After reviewing the expert comments and the results of the statistical analysis, the number of IC items stood at 29, KM practices at 48, market performance at 3 and innovation performance at 5.

Finally, in the fifth stage, the survey was pre-tested with a sample of 125 Finnish specialists familiar with IC and KM due to their educational background. Based on the collected test data, principal-component factor analysis was utilised to reduce the items that did not load to the theorised appropriate components of IC and KM practices. Thereby, these tasks finalised the questionnaire development process, as demonstrated in Figure 7. Eventually, the survey included 28 items for IC, 43 for KM practices, 3 for market performance and 5 for innovation performance. The scales and items are presented in Appendix 1, while the scales and the related literature sources for the different dimensions of IC, KM practices and firm performance are presented in Table 1.
3.4 Development of the survey instrument

Figure 7. A flowchart of the survey instrument development

Stage 1
Review of the previous IC and KM literature

Stage 2
Adoption of the relevant validated measurement scales

Stage 3
Self-development of the survey scales and items

Stage 4
Utilisation of expert panels to evaluate the survey validity

Stage 5
Pre-test of the survey

Final survey
IC measured by 28 items, KM practices by 43 items, market performance by 3 items and innovation performance by 5 items
3.5 Analyses

The collected data was analysed by means of factor analysis, structural equation modeling (SEM) and analysis of variance (ANOVA). Partial least squares (PLS) (version 2.0M3 of SmartPLS), LISREL (version 8.50) and IBM SPSS Statistics (version 22) were used for analysis while PRELIS 2.50 was used to compute the covariance matrix for factor analysis conducted with LISREL. In practice, SEM was used for hypotheses testing in Publications III and IV, and ANOVA was used in Publication V for statistical comparisons.

In Studies III and IV, the measurement models were assessed in terms of internal consistency and discriminant validity. The internal consistency was measured in terms of construct reliability (CR) and convergent validity. The test results for the CR should showcase a value above the generally accepted threshold of 0.7 (Bagozzi and Yi, 1991). The test for convergent validity examines the values of CR, the factor loadings, and average variance extracted (AVE). The factor loadings ought to be statistically high throughout to demonstrate that all the items are related to their specific constructs and verify the hypothesised relationships between the indicators and constructs. The AVE measures should exceed the critical cut-off point of 0.50 (e.g. Fornell and Larcker, 1981) regarding all the constructs. In the test for discriminant validity, the extent to which the constructs differ from each other is assessed. In effect, the AVE of the construct should be greater than the variance shared between that construct and the other constructs in the model (Fornell and Larcker, 1981). Detailed descriptions of the test results are available in the publications.

Confirmatory factor analysis (CFA) was used in Publication V to assess the quality of the theorised factor structure of IC and KM practices by statistically testing the significance of the overall model and item loadings on the factors. In effect, this technique was utilised to test how well the collected empirical data fit the developed theoretical model, and to compare the theorised model with alternative models (e.g. Hinkin, 1998; DeVellis, 2003; Hair et al., 2006). CFA as a validation method is useful as it enables explicit assessment of the theoretical concepts, non-observational hypotheses and errors (Smith et al., 1996).

The hypothesised causal relationships between the constructs (i.e. IC, KM practices and firm performance) were assessed in Publications III and IV by means of SEM. SEM was selected as a suitable tool for analysis for its ability to provide evidence of systematic co-variation and capability to demonstrate that a relationship is not spurious (e.g. Hair et al., 2006; Metsämuuronen, 2006). SEM is first and foremost a confirmatory method to assess theorised causalities; thus, the researcher must first establish a theory and only after that test for the hypothesised causalities.

In Publication V, the levels of differences regarding market and innovation performance between the four firm profiles were tested by means of an ANOVA comparison of means, with the Bonferroni post-hoc test for the comparisons. This is an advanced approach to assess statistically significant differences between several groups. Also, a post-hoc test of
the ANOVA is able to show in more detail where the statistically significant differences between groups stem from.

3.6 A summary of the analyses

The following Table 2 summarises the conducted analyses in each publication. More detailed information related to analysis is available in the publications.
### Table 2. A summary of the analyses

<table>
<thead>
<tr>
<th>Title</th>
<th>Publication I</th>
<th>Publication II</th>
<th>Publication III</th>
<th>Publication IV</th>
<th>Publication V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main objective</td>
<td>Review of empirical research on intellectual capital and firm performance</td>
<td>Review of empirical research on knowledge management practices and firm performance</td>
<td>Intellectual capital and performance – Empirical findings from Finnish firms</td>
<td>Knowledge management practices and innovation performance in Finland</td>
<td>Intellectual capital, knowledge management practices and firm performance</td>
</tr>
<tr>
<td>Data</td>
<td>Previous literature</td>
<td>Previous literature</td>
<td>A cross-industry sample of Finnish firms with over 100 employees</td>
<td>A cross-industry sample of Finnish firms with over 100 employees</td>
<td>A cross-industry sample of Finnish firms with over 100 employees</td>
</tr>
<tr>
<td>N (response rate)</td>
<td>54 (reviewed articles)</td>
<td>32 (reviewed articles)</td>
<td>262 (17.2%)</td>
<td>259 (17.0%)</td>
<td>259 (17.0%)</td>
</tr>
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<td>Dependent variable</td>
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<td></td>
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<td>Innovation performance</td>
<td>Market performance and innovation performance</td>
</tr>
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<td>Independent variable</td>
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<td>KM practices</td>
<td>The overall IC and the overall use of KM practices not applicable</td>
</tr>
<tr>
<td>Control variable</td>
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<td></td>
<td>Firm age, sales and industry</td>
<td>Firm age, the number of employees and industry</td>
<td></td>
</tr>
<tr>
<td>Statistical analysis method</td>
<td></td>
<td></td>
<td>Structural equation modeling using PLS</td>
<td>Structural equation modeling using PLS</td>
<td>Confirmatory factor analysis using LISREL; A one-way analysis of variance using SPSS</td>
</tr>
</tbody>
</table>

*a* Publication was a systematic literature review and therefore the content of the row is inapplicable.
4 A summary of the publications and the results

This part summarises the five research articles that addressed the five sub-questions of the dissertation. First, each article is discussed separately related to the objectives, gained results and contribution. After that, all the results are combined to answer the main research question of the dissertation.

The discussion of Publications I and II assesses the current state of understanding about the relationships between IC and firm performance, as well as KM practices and firm performance. After that, Publications III and IV are examined to assess the conceptual model related to IC and innovation and market performance of the firm, and KM practices and the firm’s innovation performances. The section on Publication V concludes the empirical study by examining what is the relationship between the overall level of IC, utilisation of KM practices and the firm’s innovation and market performance. Together, these articles establish an overarching view of the knowledge-based competitive advantage of the firm.

4.1 Publication I: Review of empirical research on intellectual capital and firm performance

4.1.1 Background and objective

IC has been identified as one of the key sources of sustainable competitive advantage of the firm (Drucker, 1993; Grant, 1996; Edvinsson and Malone, 1997; Stewart, 1997; Sveiby, 1997). It has been commonly conceptualised as all the knowledge and competences that can be leveraged for sustained competitive advantage of the firm (Roos and Roos, 1997; Stewart, 1997; Sullivan, 1998). Especially, the three IC dimensions of human, structural/organisational and relational capital have been used to operationalise the firm’s valuable intangible resources and demonstrate the crucial role of IC for modern firms (e.g. Edvinsson and Malone, 1997; Stewart, 1997; Bontis, 1998). However, no previous study has gathered the relevant empirical evidence together in order to assess what is the relationship between the three IC dimensions and firm performance outcomes; thus, the objective of this article was to recap the current understanding on the association between IC and firm performance. This was done by means of a systematic literature review among the peer-reviewed journal publications.

4.1.2 Results and contribution

Figure 8 demonstrates the key results of the literature review. The study outlined that the association between IC and firm performance is a product of interactions, combinations and mediations. One recurring theme was that the interaction of IC dimensions explain variations in firm performance. For some firms, the combined effect of human and structural/organisational capital was the most significant, while others benefitted from high levels of human and relational capital; thus, the first noteworthy result of this article
was that firms are likely to benefit from different IC profiles. Another found theme within the literature was that utilisation of mediator models enabled better understanding of the relationship between IC and firm performance. On one hand, it was pointed out that IC was associated with firm performance through its influence over the various organisational capabilities (e.g. knowledge processes, dynamic capabilities and innovation capabilities). On the other hand, organisational and managerial processes and practices were noticed to be associated with firm performance through their influence over the firm’s IC. The third recognised theme was that IC, especially the value embedded in and derived from relationships and networks, was associated with innovations.

**Note:** HC: human capital; RC/SC: relational and social capital; SC/OC: structural and organisational capital

**Figure 8.** The key findings of Publication I

### 4.2 Publication II: Review of empirical research on knowledge management practices and firm performance

#### 4.2.1 Background and objective

In addition to the firm’s valuable knowledge base, the other decisive driver for sustainable competitive advantage is the capability to use and develop knowledge (Grant, 1996; Kogut and Zander, 1992; Spender and Grant, 1996). KM is the pioneering academic discipline that discusses about the practices and processes which are aimed at unleashing the firm’s intellectual potential by more effective and efficient management of its organisational knowledge resources (e.g. Davenport and Prusak, 1998; Gold et al., 2001; Lee and Choi, 2003; Nonaka and Takeuchi, 1995; Von Krogh, 1998). The impact of KM research has been stalling due to the prevalent focus on spontaneous knowledge processes (e.g. knowledge acquisition, creation, sharing and utilisation) that occur even without managerial moderation; thus, examination of these knowledge processes has provided
only limited managerial contribution. In order to address this lack of managerial focus, some researchers have recently started to write about KM practices (e.g. Andreeva and Kianto, 2012; Kianto et al., 2014). These are conscious and systematic managerial and organisational practices that leverage the firm’s IC to create firm performance benefits (e.g. Andreeva and Kianto, 2012; Foss and Michailova, 2009; Kianto et al., 2014).

The objective of this article was to recap the current understanding on the association between KM practices and firm performance. In order to do that, the relevant KM literature was reviewed to identify the organisational and managerial practices that have been noticed to influence firm performance through knowledge-based issues. In addition, as this was the first ever review of KM practices, another objective was to add structure to the field by gathering together a relevant body of literature that had been published also in non-KM journals.

4.2.2 Results and contribution

In order to add structure to the literature and enable more focused analysis, the reviewed articles were arranged within a pre-defined KM template originally created by Heisig (2009). It proved to be a sound approach, as the reviewed literature organised without problems into four categories of the template: human-focused practices, technology-oriented practices, organisation-oriented practices and management process-oriented practices.

This review pointed out that three focus categories (i.e. human-oriented, technology-oriented and management process-oriented KM practices) were associated with the firm’s innovation performance. Within these categories, three KM practices were found to be especially significant antecedents for innovation: knowledge-based HRM practices, technology-oriented practices for KM and strategic KM practices. Also, KM leadership was found to influence innovations in some studies. The HRM practices and technology-oriented KM practices were related to innovation directly and also through their influence over knowledge processes. Even though strong evidence was demonstrated on the association between KM practices and innovation performance, the reviewed studies did not find similar connection between KM practices and financial performance figures; therefore, it is very likely that various other organisational resources and competences need to be combined and examined together with KM practices in order to establish understanding about firm performance dynamics. In addition, this systematic literature review highlighted that successful KM leadership was associated with qualities such as inspiration, participation, task delegation and support, as well as with a capability to create an atmosphere of trust and learning. Finally, from the organisation-oriented practices point-of-view, role-setting and creation of specific units were more significant firm performance drivers than power distribution. The summary of the key results of the study are depicted in Figure 9. Solid arrows refer to a strong recurrence of the indicated relationship whereas dashed arrows indicate slightly weaker evidence.
A summary of the publications and the results

Figure 9. The key findings of Publication II

- Human-oriented KM practices
  - Knowledge-based HRM practices
  - KM leadership

- Technology-oriented KM practices

- Management process-oriented KM practices
  - Knowledge protection
  - Strategic KM practices

- Organization-oriented KM practices
  - Power decentralisation
  - Establishing roles and units

Knowledge processes (i.e. knowledge acquisition, creation, sharing, and utilisation)

Innovation performance

Non-financial performance
4.3 Publication III: Intellectual capital and performance – Empirical findings from Finnish firms

4.3.1 Background and objective

It has been widely suggested that firm performance is nowadays grounded largely on intangible assets of the firm, such as IC (e.g. Drucker, 1993; Grant, 1996; Edvinsson and Malone, 1997; Stewart, 1997; Sveiby, 1997). The firm’s IC is typically categorised into human-based, organisation-based and relationship-based resources (Bontis, 1998; Edvinsson and Malone, 1997; Nahapet and Ghoshal, 1998; Roos and Roos, 1997; Stewart, 1997; Sullivan, 1998; Sveiby, 1997). Based on this categorisation, IC is typically measured in terms of human, structural/organisational and relational capital (e.g. Bontis, 1998; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1997). However, in the wake of the recent discussion about the traditional tripartite model’s inability to cover the whole variety of the firm’s key knowledge resources, this study included three additional IC dimensions that have not been generally addressed: renewal capital (e.g. Kianto et al., 2010; Kianto et al., 2014), entrepreneurial capital (e.g. Erikson, 2002) and trust capital (Mayer et al., 1995). In addition, relational capital was divided into internal and external dimensions, as they regard value embedded in and derived from relationships with different stakeholders (e.g. Cassiman and Veugelers, 2006). The objective of this study was to increase the understanding of IC-based value creation by empirically examining the association between the amplified model of IC and firm performance outcomes in terms of market and innovation performance. Figure 10 illustrates the hypothesised model.
Figure 10. The hypothesised model of the relationships between IC and firm performance

4.3.2 Results and contribution

The PLS software was used for the analyses to assess the reliability and validity of the measurement models and the structural models to test the hypotheses. The measurement model assessments gave good evidence of the validity and reliability for the operationalisation of the concepts. The tests for the structural models showcased that IC was able to explain 20.5% of the variation in market performance and 18.5% in innovation performance. However, the measured direct effects of the IC dimensions over market and innovation performance were mixed. Internal relational capital (i.e. intra-firm
4.3 Publication III: Intellectual capital and performance – Empirical findings from Finnish firms

collaboration) was the only dimension that was directly associated with both market and innovation performance of the firm. Further, external relational capital (i.e. the relationships with extra-firm partners) showcased significant association with innovation performance, and statistically limited association with market performance. Also trust capital was directly related with market performance of the Finnish firms. Contrary to the hypothesised effects, renewal capital, human capital and structural capital had negative relationships with market performance, and the impact of human capital was negative on innovation performance. The summarised results of the study are depicted in Table 3.

This article contributed to the literature by demonstrating the validity of the seven-dimensional model of IC. The results also suggested that trust capital was an integral factor for competitive advantage. For managers, this study pointed out that intra-firm collaboration and a climate of trust are especially relevant to market performance, whereas the relationships with extra-firm partners seemed to improve innovation performance.
### Table 3. The summarised results of Publication III

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hypothesis 1</strong>: Renewal capital is positively associated with the firm’s market performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 2</strong>: Entrepreneurial capital is positively associated with firm’s market performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 3</strong>: Human capital is positively associated with the firm’s market performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 4</strong>: Structural capital is positively associated with the firm’s market performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 5</strong>: Internal relational capital is positively associated with the firm’s market performance.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>Hypothesis 6</strong>: External relational capital is positively associated with the firm’s market performance.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>Hypothesis 7</strong>: Trust capital is positively associated with the firm’s market performance.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>Hypothesis 8</strong>: Renewal capital is positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 9</strong>: Entrepreneurial capital is positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 10</strong>: Human capital is positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 11</strong>: Structural capital is positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 12</strong>: Internal relational capital is positively associated with the firm’s innovation performance.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>Hypothesis 13</strong>: External relational is positively associated with the firm’s innovation performance.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>Hypothesis 14</strong>: Trust capital is positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
</tbody>
</table>
4.4 Publication IV: Knowledge management practices and innovation performance in Finland

4.4.1 Background and objective

Recent research has demonstrated that KM provides organisations with an effective framework to implement their innovation strategies (Ciabuschi and Martin, 2012; Moustaghfir and Schiuma, 2013; Quintane et al., 2011; Rasmussen and Nielsen, 2011). A growing body of literature has also suggested that KM is associated with the firm’s innovation (Andreeva and Kianto, 2011; Chen et al., 2010; Lee et al., 2013; Lin et al., 2012). However, most of the research has dealt with the relationship between knowledge processes (e.g. knowledge acquisition, creation and sharing) and innovation performance (e.g. Chen et al., 2010; Lee et al., 2013), or only one or a few KM practices and innovation performance (e.g. Camelo-Ordaz et al., 2011; Chen and Huang, 2009; Donate and Canales, 2012; Hurmelinna-Laukkanen, 2011; Sarin and McDermott, 2003; Soto-Acosta et al., 2014; Yang et al., 2009); thus, the literature so far has not been able to provide overarching managerial implications about the KM practices and innovation performance. In order to close the identified gap within the literature, this article empirically examined the association between ten categories of KM practices and their association with the firm’s innovation performance. The objective of this article was to contribute detailed knowledge on how different managerial and organisational knowledge-based practices were associated with the firm’s ability to innovate. Figure 11 illustrates the hypothesised relationships of the conceptual model.
4.4.2 Results and contribution

The PLS software was used to assess the reliability and validity of the measurement models and the structural models to test the set hypotheses. The measurement model assessments gave good evidence on the validity and reliability for the operationalisation of the concepts. The test for the structural model indicated that KM practices were able to explain 15% of the variation within the firm’s innovation performance. In effect, strategic KM practices, knowledge-based compensation practices and IT practices demonstrated the hypothesised effects, while the path estimates from the knowledge-based recruiting practices and learning mechanisms proved to be against the hypotheses.
The direct effects from the other KM practices to innovation performance were measured to be insignificant. The summarised results of the publication are showcased in Table 4.

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hypothesis 1</strong>: Supervisory work is positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 2</strong>: Knowledge protection practices are positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 3</strong>: Strategic KM practices are positively associated with the firm’s innovation performance.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>Hypothesis 4</strong>: Knowledge-based recruiting practices are positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 5</strong>: Knowledge-based training and development practices are positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 6</strong>: Knowledge-based performance appraisal practices are positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 7</strong>: Knowledge-based compensation practices are positively associated with the firm’s innovation performance.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>Hypothesis 8</strong>: Learning mechanisms are positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
<tr>
<td><strong>Hypothesis 9</strong>: IT practices are positively associated with the firm’s innovation performance.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>Hypothesis 10</strong>: KM supportive work organising is positively associated with the firm’s innovation performance.</td>
<td>Rejected</td>
</tr>
</tbody>
</table>

This article contributed to the discussion on the KBV, KM and innovation management by utilising empirical data with a large sample size in order to demonstrate the validity of a novel ten-category model of KM practices and its association with innovation performance of the firm. For managers, it pointed out the three most effective KM practices that influence the firm’s innovation performance: strategic KM to distinguish the strategic knowledge gap and to enable highly focused knowledge creation and inbound knowledge flows to close the identified gap; knowledge-based compensation practices to encourage employees’ engagement in knowledge creation, sharing and utilisation; and IT practices to facilitate new means of information search, gathering, and analyses and to leverage the available information for improved decision-making.
4.5 Publication V: Intellectual capital, knowledge management practices and firm performance

4.5.1 Background and objective

The academic discussions on IC and KM practices both address the key knowledge of the firm and its influence over firm performance outcomes. However, they approach the phenomenon from different perspectives, as IC is primarily a vehicle to identify and measure the strategic key knowledge resources of the firm, while KM practices regard the organisational and managerial practices to leverage the valuable knowledge base (i.e. IC) to create competitive advantage (e.g. Kianto et al., 2014). The literature on IC has delivered plenty of evidence about the relationship between IC and firm performance. Particularly, researchers have pointed out that firm performance gains accrue mainly from combinations and interactions between different IC dimensions (Kamukama et al., 2010; Maditinos et al., 2010; Sharabati et al., 2010; Jardon and Martos, 2012; Kim et al., 2012) and that IC is associated with the firm’s innovation performance (Carmona-Lavado et al., 2010; Cabello-Medina et al., 2011; Leitner, 2011; Wang and Chen, 2013; Subramaniam and Youndt, 2005). Also, it has been suggested that organisational processes and practices, especially HRM practices, are important facilitators of IC (Wang and Chen, 2013; Yang and Lin, 2009; Youndt and Snell, 2004; Youndt et al., 2004) and that the level of the firm’s IC is a decisive factor in establishing innovation capabilities (Mathuramaytha, 2012; Menor et al., 2007) and dynamic capabilities (Hsu and Sabherwal, 2011; Wu et al., 2007).

A basic understanding of the association between KM practices and firm performance has also been established to some extent. The empirical literature has demonstrated that firms are likely to generate innovations by investing in HRM practices (Camelo-Ordaz et al., 2011; Chen and Huang, 2009; Kamhawi, 2012; Kuo, 2011; Soto-Acosta et al., 2014), KM leadership (Borzillo and Kaminska-Labbé, 2011; Harvey et al., 2015; Sarin and McDermott, 2003), technology-oriented KM practices (Chuang et al., 2013; Khalifa et al., 2008; Yang et al., 2009), strategic KM practices (Abdullah et al., 2013; Kamhawi, 2012) and knowledge protection (Hurmelinna-Laukkanen, 2011). Also, it has been suggested that knowledge processes (i.e. knowledge acquisition, creation, sharing and utilisation) can be regarded as mediating factors that explain the relationship between HRM practices (Chen and Huang, 2009; Kuo, 2011; Soto-Acosta et al., 2014) and technology-oriented KM practices (Kamhawi, 2012; Lee et al., 2012) and firm performance outcomes.

The objective of this article was to further the discussion on the firm’s knowledge-based performance drivers by empirically examining the relationship between IC, KM practices and firm performance.
4.5.2 Results and contribution

In order to answer the sub-question, the sample of the Finnish firms was first distributed into four categories based on median split regarding the overall level of IC of the firm and the level of utilisation of KM practices. This was done by calculating summated scores for both IC and KM practices to obtain composite indicators, and then dividing them into two low and high sub-samples. As a result, four distinct categories were attained characterised by (1) high IC and low KM practices, (2) high IC and high KM practices, (3) low IC and low KM practices, and (4) low IC and high KM practices. Figure 12 exhibits the attained categories after the median split.

![Figure 12. The four categories with different levels of IC and KM practices](image)

Then, the levels of differences regarding market and innovation performance between the four firm profiles were tested by means of ANOVA. The results suggested that the firms with high levels of overall IC (Profiles 1 and 2) were more innovative than those with lower levels of IC (Profiles 3 and 4). There was no statistical difference in innovation performance between Profiles 1 and 2, nor did the utilisation of KM practices contribute significantly to innovation performance of the firm. The results, however, pointed out that Profile 2, which was high in terms of both IC and KM practices, was related with statistically stronger market performance than Profile 3, characterised by low IC and low KM practices. The summary of the results is visualised in Figure 13.
For managers, this article shows that IC is a crucial resource for innovation and development activities. In other words, firms are likely to fulfil the preconditions for innovativeness by investing into a sufficient overall amount of IC. However, in order to secure competitive advantage, firms need KM practices to leverage the IC. This study contributes to the literature on the KBV, IC, KM and innovation by demonstrating the merits of letting IC flourish into innovations without managerial control, but also highlights the role of sophisticated KM practices in transforming ideas and innovations into competitive advantage.

4.6 The summarised results of the entire study

Table 5 summarises the sub-questions and the main contributions of each research paper in the dissertation. The first two studies were systematic literature reviews which established an overall understanding of the relationship between IC, KM practices and firm performance, while the three latter publications were empirical studies.
Table 5. The summarised results of the five publications

<table>
<thead>
<tr>
<th>Publication I</th>
<th>Publication II</th>
<th>Publication III</th>
<th>Publication IV</th>
<th>Publication V</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>Review of empirical research on intellectual capital and firm performance</td>
<td>Review of empirical research on knowledge management practices and firm performance</td>
<td>Intellectual capital and performance – Empirical findings from Finnish firms</td>
<td>Knowledge management practices and innovation performance in Finland</td>
</tr>
<tr>
<td><strong>Sub-research question</strong></td>
<td>What is the current understanding on how the intellectual capital dimensions influence firm performance outcomes?</td>
<td>What is the current understanding on how knowledge management practices influence firm performance outcomes?</td>
<td>What is the association of different intellectual capital dimensions with innovation and market performance of the firm?</td>
<td>What is the association of different knowledge management practices with innovation performance of the firm?</td>
</tr>
</tbody>
</table>
5 Discussion and conclusions

This dissertation examined the key organisational resources and practices from the perspective of the knowledge-based view of the firm. The main objective was to find out what is the relationship between IC, KM practices and firm performance. Two systematic literature reviews were conducted to establish a solid understanding about the prior empirical evidence on IC, KM practices and firm performance. That was followed with a trio of empirical research papers, which utilised a novel overarching conceptual model regarding IC, KM practices and firm performance.

5.1 Answering the research questions

The main research question of the dissertation was: “What is the relationship between intellectual capital, knowledge management practices and firm performance?” It was addressed with five articles, which each focused on a sub-question.

The first sub-question “What is the current understanding on how the intellectual capital dimensions influence firm performance outcomes?” was answered by means of a systematic literature review. In particular, relevant empirical publications were recapped in order to address the research gap related to the lack of understanding regarding the relationship between IC and firm performance. The study established that IC is associated with firm performance mainly through combinations of different IC dimensions. Another recurring theme within the prior literature was that IC influences the various organisational capabilities (e.g. dynamic capabilities and innovation capabilities), which mediate the relationship between IC and firm performance. The systematic literature review also pointed out that HR management is a critical success factor of IC, and that relational/social capital is associated with innovation performance of the firm.

The second publication answered the sub-question “What is the current understanding on how knowledge management practices influence firm performance outcomes?” also by means of a systematic literature review. Again, the review was delimited to include only empirical peer-reviewed research papers, which were presumed to have relevant managerial contributions and capability to indicate the influence of KM practices on the company’s bottom-line. The study demonstrated that KM practices are related particularly with innovation performance of the firm. Specifically, a large body of evidence suggested that utilisation of knowledge-based HRM practices, technology-oriented KM practices and strategic KM practices are essentially associated with innovations. KM leadership and knowledge protection were also pointed out as innovation-supporting practices, but the evidence concerning them was slightly less robust. Moreover, utilisation of HRM practices and technology-oriented KM practices increases the likeliness to achieve innovations through their facilitating influence over knowledge processes (i.e. knowledge acquisition, creation, sharing and utilisation). Despite the strong perceived connectedness with innovations, the association between
Discussion and conclusions

KM practices and financial performance has not been convincingly demonstrated within the empirical literature; thus, it remains as an issue that permits legions of future research.

The third publication answered the sub-question “What is the association of different intellectual capital dimensions with innovation and market performance of the firm?” The results obtained from this study were mixed as the empirical testing of the conceptual model showed both significant positive and negative direct effects between the independent and dependent constructs. The hypothesised positive direct effects were recovered from the relationship between internal and external relational capital, trust capital and market performance. Furthermore, internal and external relational capital were positively associated with innovation performance of the firm. Against the hypothesised relationships, human and structural capital were negatively associated with market and innovation performance of the firm, while renewal capital exhibited a negative direct relationship with market performance. This study contributed to the literature by demonstrating the potentially most valuable IC dimensions that are likely to improve a firm’s innovation and market performance. It also pointed out that not all the IC dimensions are equally capable facilitators of firm performance. In addition, this study identified and demonstrated the viability of a seven-dimensional conceptual model of IC, which is capable of distinguishing the various key strategic intangible aspects of the firm that can be deployed in its value-creation activities. From a managerial perspective, this study established that different facets of firm performance outcomes are supported by different IC dimensions; therefore, a pinpoint configurational approach might be a more efficient option to achieve success than maximising the overall level of IC.

Publication IV answered the sub-question “What is the association of different knowledge management practices with innovation performance of the firm?” It pointed out that strategic KM, knowledge-based compensation and IT practices were associated with innovation performance according to the hypotheses. Against the hypothesised positive association, knowledge-based recruiting and learning mechanisms had a statistically negative influence on innovation performance. On one hand, this study increased awareness of the most suitable KM practices related to a firm’s innovation performance. On the other hand, the negative relationship between knowledge-based recruiting and innovation performance illustrates that firms cannot gain innovation-related competitive advantage directly from the labour market, because those resources are available also for their rivals. In addition, the unexpected negative affiliation between learning mechanisms and innovation performance suggests that learning through mentoring programs and utilisation of best practices may even hinder innovations, as they could occasionally disseminate outdated knowledge that is insufficient from the perspective of innovation and creativity. This study also contributed to the literature by suggesting and exhibiting the viability of a ten-partite conceptual model of KM practices, which enables examination of the strategic key activities related to leveraging intangible resources to create sustained competitive advantage.

Finally, the fifth publication answered the sub-question “What is the association of different levels of intellectual capital and utilisation of knowledge management practices
Discussion and conclusions

with innovation and market performance of the firm?" The results demonstrated that firms with high overall IC were more innovative than the firms with low overall IC. On a different note, the utilisation level of KM practices did not influence innovation performance. Regarding market performance, firms characterised with high overall IC and high utilisation of KM practices outperformed those firms that displayed a low overall amount of IC and low use of KM practices. These results indicate that IC is a crucial resource for innovation and creativity, but innovation management with rigorous practices is a challenging task. In addition, it seems that IC is a precondition for innovation, whereas KM practices are required to transform intellectual potential into market performance. These findings together indicate an interesting managerial learning point: depending on the firm’s strategic focus, they should use less rigorous managerial practices if innovations are the main goal, but more KM practices should be utilised if the target is to increase market performance. As a final note regarding this article, it was one of the first academic research papers that combined the IC and KM concepts to increase understanding about the knowledge-based issues that influence firm performance outcomes. As such, this study paves the way for more rigorous statistical analyses to address the interaction of IC and KM practices related to firm performance outcomes.

Next, the combined contribution of the five publications should be observed related to the main research question “What is the relationship between intellectual capital, knowledge management practices and firm performance?” Beginning from IC, the three articles which assessed its influence over firm performance outcomes, either through a literature review or empirically, yielded complementary results that also varied slightly between the publications. Considering all the garnered evidence, it is strongly suggested that IC influences firm performance through combinations, wherein several IC dimensions interact to create value. Also, IC seems to be a strategic key resource of a firm as it increases the organisational capabilities which are directly associated with the level of firm performance. A notable piece of evidence also pointed out that IC is a key factor of innovation performance. One paper suggested that an overall level of IC is capable of predicting the innovation performance of a firm, whereas two articles found that especially relationship-based IC (i.e. internal relational capital, external relational capital, social capital) is likely to be a key building block of innovations. In sum, this dissertation shows that possession of a high overall level of IC is an ideal condition that creates competitive advantage because IC resources create value (a) through combinations (i.e. more IC allows more combinations) and (b) through boosting organisational capabilities and innovation. However, an efficiency benefit of a more pinpointed approach to investing and developing IC is also recommended, as relational capital was regarded as an important antecedent of innovation.

Regarding the KM practices aspect, which was assessed also in three publications, the overall findings were quite a bit more challenging to synthesise. First of all, the systematic literature review of the previous research papers suggested that many KM practices have direct associations with innovation performance of a firm. Particularly sound evidence was attained on the relationship between knowledge-based HRM practice, technology-focused KM practices and strategic KM practices. Moreover, Publication IV empirically
bolstered the findings of the literature review, by explicating that strategic KM, knowledge-based compensation (one of the four knowledge-based HRM practices) and IT practices were statistically significant contributors for innovation within the Finnish firms. However, against the hypotheses, learning mechanisms and knowledge-based recruiting (another of the four knowledge-based HRM practices) were negatively associated with innovation performance. Therefore, based on the findings from Publications II and IV, it can be argued that firms are likely to benefit in terms of innovation performance, when they (a) establish a knowledge strategy, regularly update it, and disseminate it throughout the organisation; (b) adopt technology-enabled solutions to enhance communication, information search and discovery, data analysis, co-development of new products and services with their external stakeholders; and (c) consider knowledge as a key resource in HRM-related functions, especially in rewarding and compensation. Aside from these three KM practices, the other studied ones did not demonstrate strong positive associations to firm performance outcomes. In fact, learning mechanisms (i.e. knowledge transfer from the firm’s knowledge base to individuals) and knowledge-based recruiting were regarded as innovation-blocking practices, because they focus on deploying knowledge resources that do not bear sufficient value potential to gain above average returns. Finally, the results of Publication V indicated that the overall level of IC was a more decisive driver of innovation performance than the utilisation level of KM practices. In turn, KM practices were deemed as valuable for those firms that aimed to improve their market performance. This suggests that the firms which already have a sufficient level of innovation and would like to focus more on exploitation of them, should utilise KM practices to be more organised and rigorous in the execution of their value-creation activities.

5.2 Contributions and implications to resource- and knowledge-based views of the firm

The high level contribution of this dissertation relates to discussions on the resource- and knowledge-based views of the firm. In addition, the more literature stream-specific contributions regard intellectual capital and knowledge management. To start with, this section recaps the contribution on the RBV and the KBV, while the two following sections focus on intellectual capital and knowledge management.

This dissertation contributed to the discussions on the RBV and the KBV by demonstrating the key organisational knowledge resources that can be leveraged to create a competitive advantage. In particular, it was pointed out that relationship-based knowledge resources (i.e. internal and external relational capital, social capital) are major drivers of innovation (e.g. Carmona-Lavado et al., 2010; Delgado-Verde et al., 2011; Inkinen et al., 2014; Subramaniam and Youndt, 2005). That finding, in fact, slightly contradicts the central message of the RBV and the KBV, which argues that competitive advantage accrues mainly due to the firm’s internal characteristics and intra-firm collaboration (Barney, 1991; Conner, 1991; Grant, 1996; Spender, 1996). However, in light of these new findings, it seems that the firm’s external relationships have become
increasingly important factors for innovation, which emphasises the legitimacy of open innovation discussion (see Chesbrough, 2003; Huizingh, 2011).

This study also indicated that knowledge resources create organisational capabilities and value through combinations. In effect, some firms benefit from the interaction of human and structural capital (e.g. Leitner, 2011; González-Loureiro and Dorrego, 2012), while some other firms leverage the combination of human and relational capital to improve firm performance (e.g. Huang and Hsueh, 2007; Hsu and Fang, 2009; Castro et al., 2013). These types of findings are in line with the RBV/KBV discussion on value creation through knowledge resource combination (e.g. Conner, 1991; Grant, 1996; Grant and Baden-Fuller, 2004; Kogut and Zander, 1992).

Moreover, this dissertation supported the previous findings that the capabilities to manage knowledge resources are equally important or even more important factors for competitive advantage than possession of resources (e.g. Grant, 1996; Kogut and Zander, 1992; Makadok, 2001; Penrose, 1959; Spender and Grant, 1996). This study contributed to the discussion on key capabilities by identifying that strategic level management of knowledge, capability to use technology support, and utilisation of knowledge-oriented HRM practices were associated with innovations (e.g. Inkinen et al., 2015; Inkinen, 2016; Kamhawi, 2012; Khalifa et al., 2008; Kuo, 2011; Soto-Acosta et al., 2014). Further, this study demonstrated that rigorous KM practices are required to deploy the firm’s knowledge resources in a market performance-enhancing manner (Inkinen et al., 2016). In addition, this dissertation supported Kianto et al.’s (2014) view that more research should be devoted to assess the interconnectedness of IC and KM practices in value creation. The current findings suggest that both aspects account for competitive advantage, but the lack of understanding about the value generating mechanisms still remains as a research gap.

5.3 Contributions and implications to intellectual capital literature

This study made contributions also to intellectual capital literature. It advanced the theoretical understanding on IC by developing and empirically validating an amplified conceptual model consisting of seven IC dimensions. In addition to the traditionally utilised three IC dimensions related to human, structural/organisational and relational capital, this study suggested that renewal capital, trust capital and entrepreneurial capital should be included, and that relational capital should be split into internal and external dimensions, as they regard value embedded in and derived from the relationships with different stakeholders. Related to that, this study contributed to IC literature by providing a measurement model that can be replicated in the further research. Utilisation of the seven-dimensional measurement model is encouraged, as it enables examination of valuable intangible resources which have not been actively studied in the past; thus, examination of this novel conceptual model could yield findings that contribute to the discussion on knowledge-based competitive advantage of the firm.
This dissertation supported the findings in previous studies (e.g., Youndt et al., 2004) that the level of the firm’s overall IC is a decisive factor for its innovation performance. In addition, this study has argued that, when the level of the firm’s overall IC is sufficiently high, it does not require active managerial supervision to inspire innovations. However, examination of IC dimensions separately related to the firm’s innovation performance suggested that only the level of relational capital was associated with innovations; thus, these findings together indicate that it is very difficult to filter out an individual IC dimension’s influence over firm performance indicators, because the value is created through combinations (c.f. Kogut and Zander, 1992; Nonaka and Takeuchi, 1995).

Aside from innovations, it was also noticed that combinations of different IC dimensions facilitated other firm performance outcomes. These relationships, however, were better distinguished through a mediating effect of organisational capabilities (i.e. dynamic capabilities, innovation capabilities and KM capabilities) which were positively associated with IC dimensions. This finding adds to the dual-message of the resource-based view of the firm, which states that the resources are required to create organisational capabilities, while the capabilities are utilised to derive knowledge-based competitive advantage or to develop new resources (e.g., Cohen and Levinthal, 1990; Grant, 1996; Nahapiet and Ghoshal, 1998; Nonaka and Takeuchi, 1995; see also Amit and Schoemaker, 1993). Therefore, knowledge as a resource and knowledge as a capability combine as a beneficial cycle that can sustain the firm’s competitive advantage. Furthermore, the empirical study highlighted internal relational, external relational and trust capital as key resources regarding market performance.

5.4 Contributions and implications to knowledge management literature

This dissertation contributed also to the KM literature. It added structure to the novel discussion on KM practices by synthesising the relevant research through a systematic literature review. It demonstrated, following the thinking of Kianto et al. (2014), that KM practice discussion differentiates from the rest of the KM literature as an individual research stream, which is able to contribute to the understanding regarding the knowledge-based competitive advantage of the firm.

Furthermore, this study increased theoretical understanding on KM by developing and empirically testing a conceptual model of KM practices and firm performance. The ten-partite categorisation is among the first overarching models to consider the relevant organisational and managerial practices that can be used to leverage the firm’s IC to create sustainable competitive advantage: thus, it opens an avenue for further research with the same research instrument. Replication of the instrument in future studies is encouraged, as it has potential to improve the relevance of the managerial contributions of the KM literature by focusing on key practices and activities that could yield competitive advantage through an efficient and effective management of IC.
Discussion and conclusions

This study also contributed to the KM literature by demonstrating the impact of KM practices as a managerial tool to improve innovation performance. It indicated that strategic KM practices, KM-supportive technological practices and HRM practices were the likely drivers of the firm’s innovation performance; therefore, this study has extended the discussions on the strategic key roles of IT support for KM (e.g. Alavi and Leidner, 2001; Andreeva and Kianto, 2012), strategic KM (e.g. Dalkir, 2005; McKeen et al., 2005; Von Krogh et al., 2001; Zack, 1999a) and HRM support for KM (e.g. Hislop, 2003; Scarbrough, 2003; Wong, 2005).

However, simultaneous analysis of KM practices and IC indicated that IC has much more leverage over the innovation performance, whereas KM practices were needed to transform the knowledge potential into competitive advantage. This result is interesting for knowledge management research and practice, as it points out the less-discussed approach of letting innovation flourish without much managerial control, and also highlights the sense of management step-in when the focus is on an increase in market performance.

5.5 Managerial implications

The managerial learning point of this study is the improved understanding of the importance of knowledge-based issues for firm performance. This study specified the most relevant IC dimensions for firm success in terms of market and innovation performance. It pointed out that firms are more likely to be successful when they are able to establish a trait of trust in internal and external operations, and that the investments in intra-firm collaboration and extra-firm networks are likely to boost the firm’s market and innovation performance. Moreover, the results indicated that firms should secure a high overall level of IC to be innovative, while a lack of IC is likely to block the firms from being innovative. This is most likely due to the tendency of IC to influence the firm’s capabilities and performance outcomes through combinations of different dimensions; thus, if there is a lack of one of the IC dimensions, the combinative ability of IC diminishes and holds back the firm from achieving its innovation goals.

This study also pointed out the KM practices that are substantial for innovations. Especially, it turned attention to HRM practices, technology-oriented KM practices and strategic KM practices as the key practices that should be used to leverage the firm’s IC to inspire innovation performance. From the selection of HRM practices, the study found that knowledge-based compensation increases the employees’ participation in knowledge creation, sharing and utilisation of the knowledge-base, while technology utilisation provides access to new knowledge resources and enables better and quicker decision-making through efficient analysis of the complex data. The study likewise found that the process of developing a knowledge-based strategy, disseminating it throughout the firm, and actively updating strategy helps firms to identify their strategic key knowledge and steer the attention and investments to the most value-creating activities.
The third managerial implication regards the association between KM practices and competitive advantage. In effect, while the possession of high overall IC is regarded as a key premise for innovations, KM practices are needed to transform the knowledge potential into market performance; thus, based on their innovation and business strategies, firms should select between IC-based and KM practice-based approaches. For instance, a firm should avoid strict managerial control and invest in generating trust and collaboration if innovations are regarded as the strategically most important outcome. In turn, higher utilisation of KM practices is permitted when the firm’s key strategic goal is to become more efficient in exploiting its knowledge potential. In sum, these implications on KM practices are highly relevant for managers, as they regard the practical-level solutions for efficient and effective management of the firm’s IC.

5.6 Limitations and future research

When interpreting the results of this study, one should consider some limiting factors, which also serve as a basis for future studies. First, the empirical study did not explicitly examine the interaction terms between different IC dimensions and their influence on firm performance outcomes, even though such a relationship was found as a result of the systematic literature review. This study assessed the direct singular impacts of each IC dimension on firm performance. Future studies can utilise the same research instrument to evaluate the combined effect of IC dimensions over firm performance. The results of that kind of study could also help to explain why the direct effects of some IC dimensions were negative in this study, and if the three empirically confirmed relationships still hold true when the interaction terms are included. Similarly, this study tested only the direct effects of each KM practice over firm performance. The interaction terms of these practices should be tested against firm performance outcomes in order to identify a set of synergetic KM practices that can be employed to create competitive advantage.

This study was one of the pioneering attempts to merge IC and KM approaches to investigate knowledge-based value creation in a firm. While it presented arguments about the complementary theoretical premises of IC and KM practices, and empirically demonstrated their different influences over the firm performance, the evidence is still limited. For instance, this study did not rigorously examine the interactions of IC and KM practices in relation to firm performance, but based the analysis on simplistic high/low variable pairs that were established by a median split. Future research should go deeper into the analysis and empirically test, for example, if the suggested mediation and moderation effects exist between IC and KM practices (see Kianto et al., 2014).

The data for the empirical part of this dissertation was collected by surveying the company representatives. Even though the survey approach was considered as the most suitable option to examine the association between IC, KM practices and firm performance in this study, utilisation of alternative approaches could have also been useful. For instance, interview and action research strategies might have gendered more detailed knowledge about why and how firms utilised KM practices and what sort of IC
Discussion and conclusions

Dimensions were evaluated as strategically significant. That sort of knowledge would have complemented the survey data and enabled more extensive analysis; thus, another future research direction could be to use other than survey research approaches or multi-method research to increase understanding about the significance of possession of IC and utilisation of KM practices over firm performance.

The survey study used a key-informant technique to collect data, wherein a single-respondent per company assessed all the variables in the survey. This approach sets a concern for potential common method bias. Even though the bias was not a problem in this study, future research could improve the methodological rigor by assessing performance through objective measures and by involving different respondents with different organisational roles to assess the measures for independent and dependent variables.

Furthermore, the empirical part of this dissertation was a cross-sectional survey study. In order to further validate the causal relationships between independent and dependent variables, a longitudinal study setting should be used in future research. The researchers should be prepared to collect time-series data to enable such analysis.

The final limitation of this study is that the empirical study focused only on a cross-industry sample of Finnish firms with over 100 employees. Finland is an economically highly developed country, has well-educated citizens and regularly tops the charts in terms of creativity and innovation (e.g. Jamrisko and Lu, 2016; Florida et al., 2016); therefore, it does not represent an average country with average intellectual potential. This research should be replicated in economically similar and different countries in order to further validate the research instrument and to create knowledge about how the knowledge-based value creation differs in various country contexts.

5.7 Conclusion

This study demonstrated the influence of knowledge-based factors over firm performance outcomes. In an attempt to answer the research question “What is the relationship between intellectual capital, knowledge management practices and firm performance?” it conducted two systematic literature reviews and empirically examined a conceptual model that was based on a thorough understanding of the literature. The results of these studies pointed out key strategic valuable IC dimensions and KM practices that can be utilised to leverage the firm’s IC to create competitive advantage. Especially, it was pointed out that relationship-centred IC enables innovation and market performance, and that strategic KM practices, technology-oriented KM practices and knowledge-based compensation are efficient practices to boost innovation. In addition, this dissertation indicated that IC influences firm performance through combinations of different IC dimensions, and that a high level of IC is sufficient to permit the creativity and innovativeness of a firm. However, creating a competitive advantage over rivals requires the utilisation of KM practices as well. Therefore, a pivotal challenge for a firm these days is to establish a balance between an IC-building strategy that lets innovation flourish,
and a more performance-oriented one that focuses on leveraging the IC base to create competitive advantage. This study paves the way also for numerous future research directions. In particular, the competitive advantage of the firm related to the interaction of the IC dimensions and KM practices should be studied further.
References


References


References


Mouritsen, J., Buhk, N., Flagstad, K., Thorbjørnsen, S., Johansen, M., Kotnis, S., Thorsgaard Larsen, H., Nielsen, C., Kjærgaard, I., Krag, L., Jeppesen, G., Haisler, J. and


References


References


### Appendix A: The measurement items

#### Appendix 1. The measurement items

**FIRM 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)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MARKPER1</td>
<td>Net sales growth</td>
</tr>
<tr>
<td>MARKPER2</td>
<td>Profitability</td>
</tr>
<tr>
<td>MARKPER3</td>
<td>Market share</td>
</tr>
</tbody>
</table>

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)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>INNOPER1</td>
<td>Products and services for customers</td>
</tr>
<tr>
<td>INNOPER2</td>
<td>Production methods and processes</td>
</tr>
<tr>
<td>INNOPER3</td>
<td>Management practices</td>
</tr>
<tr>
<td>INNOPER4</td>
<td>Marketing practices</td>
</tr>
<tr>
<td>INNOPER5</td>
<td>Business models</td>
</tr>
</tbody>
</table>
To what extent do the following statements on internal cooperation apply to your company? (1 = completely disagree, 5 = completely agree)

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTREL1</td>
<td>Different units and functions within our company – such as R&amp;D, marketing and production – understand each other well.</td>
</tr>
<tr>
<td>INTREL2</td>
<td>Our employees frequently collaborate to solve problems.</td>
</tr>
<tr>
<td>INTREL3</td>
<td>Internal cooperation in our company runs smoothly.</td>
</tr>
</tbody>
</table>

To what extent do the following statements on external cooperation apply to your company? (1 = completely disagree, 5 = completely agree)

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXTREL1</td>
<td>Our company and its external stakeholders – such as customers, suppliers and partners – understand each other well.</td>
</tr>
<tr>
<td>EXTREL2</td>
<td>Our company and its external stakeholders frequently collaborate to solve problems.</td>
</tr>
<tr>
<td>EXTREL3</td>
<td>Cooperation between our company and its external stakeholders runs smoothly.</td>
</tr>
</tbody>
</table>

To what extent do the following statements on internal structures apply to your company? (1 = completely disagree, 5 = completely agree)

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRUCAP1</td>
<td>Our company has efficient and relevant information systems to support business operations.</td>
</tr>
<tr>
<td>STRUCAP2</td>
<td>Our company has tools and facilities to support cooperation between employees.</td>
</tr>
<tr>
<td>STRUCAP3</td>
<td>Our company has a great deal of useful knowledge in documents and databases.</td>
</tr>
<tr>
<td>STRUCAP4</td>
<td>Existing documents and solutions are easily accessible.</td>
</tr>
</tbody>
</table>
### Appendix A: The measurement items

#### To what extent do the following statements on employee competence apply to your company? (1 = completely disagree, 5 = completely agree)

<table>
<thead>
<tr>
<th>HUMCAP1</th>
<th>Our employees are highly skilled at their jobs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUMCAP2</td>
<td>Our employees are highly motivated in their work.</td>
</tr>
<tr>
<td>HUMCAP3</td>
<td>Our employees have a high level of expertise.</td>
</tr>
</tbody>
</table>

#### To what extent do the following statements on renewal apply to your company? (1 = completely disagree, 5 = completely agree)

<table>
<thead>
<tr>
<th>RENCAP1</th>
<th>Our company has acquired a great deal of new and important knowledge.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RENCAP2</td>
<td>Our employees have acquired a great deal of important skills and abilities.</td>
</tr>
<tr>
<td>RENCAP3</td>
<td>Our company can be described as a learning organisation.</td>
</tr>
<tr>
<td>RENCAP4</td>
<td>The operations of our company can be described as creative and inventive.</td>
</tr>
</tbody>
</table>

#### To what extent do the following statements on trust apply to your company? (1 = completely disagree, 5 = completely agree)

<table>
<thead>
<tr>
<th>TRUSCAP1</th>
<th>The way our company operates is characterised by an atmosphere of trust.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRUSCAP2</td>
<td>We keep our promises and agreements.</td>
</tr>
<tr>
<td>TRUSCAP3</td>
<td>Our company seeks to take the interests of its stakeholders into account in its operations.</td>
</tr>
<tr>
<td>TRUSCAP4</td>
<td>The expertise of our company inspires trust in stakeholders.</td>
</tr>
<tr>
<td>TRUSCAP5</td>
<td>The image and reputation of our company inspire trust in stakeholders.</td>
</tr>
</tbody>
</table>

#### To what extent do the following statements on the entrepreneurial orientation apply to your company? (1 = completely disagree, 5 = completely agree)

<table>
<thead>
<tr>
<th>ENTCAP1</th>
<th>Risk-taking is regarded as a positive personal quality in our company.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTCAP2</td>
<td>Our employees take deliberate risks related to new ideas.</td>
</tr>
<tr>
<td>ENTCAP3</td>
<td>Our employees are excellent at identifying new business opportunities.</td>
</tr>
<tr>
<td>ENTCAP4</td>
<td>Our employees show initiative.</td>
</tr>
<tr>
<td>ENTCAP5</td>
<td>The operations of our company are defined by independence and freedom in performing duties.</td>
</tr>
<tr>
<td>ENTCAP6</td>
<td>Our employees have the courage to make bold and difficult decisions.</td>
</tr>
<tr>
<td>KNOWLEDGE MANAGEMENT PRACTICES</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td></td>
</tr>
<tr>
<td>To what extent do the following statements on supervisory work apply to your company? (1 = completely disagree, 5 = completely agree)</td>
<td></td>
</tr>
<tr>
<td>KMLEAD1 Supervisors encourage employees to share knowledge at the workplace.</td>
<td></td>
</tr>
<tr>
<td>KMLEAD2 Supervisors encourage employees to question existing knowledge.</td>
<td></td>
</tr>
<tr>
<td>KMLEAD3 Supervisors allow employees to make mistakes, and they see mistakes as learning opportunities.</td>
<td></td>
</tr>
<tr>
<td>KMLEAD4 Supervisors value employees’ ideas and viewpoints and take them into account.</td>
<td></td>
</tr>
<tr>
<td>KMLEAD5 Supervisors promote equal discussion in the workplace.</td>
<td></td>
</tr>
<tr>
<td>KMLEAD6 Supervisors share knowledge in an open and equal manner.</td>
<td></td>
</tr>
<tr>
<td>KMLEAD7 Supervisors continuously update their own knowledge.</td>
<td></td>
</tr>
</tbody>
</table>

| To what extent do the following statements on knowledge protection apply to your company? (1 = completely disagree, 5 = completely agree) |
| KPROT1 Our company’s strategic knowledge is protected from those stakeholders for whom it is not intended. |
| KPROT2 If necessary, our company uses patents, agreements, legislation and other formal means to protect its strategic knowledge. |
| KPROT3 If necessary, our company uses confidentiality, employee guidance and other informal means to protect its strategic knowledge. |

| To what extent do the following statements on strategic knowledge and competence management apply to your company? (1 = completely disagree, 5 = completely agree) |
| STRATKM1 Our company strategy is formulated and updated based on company knowledge and competences. |
| STRATKM2 Our company strategy addresses the development of knowledge and competences. |
| STRATKM3 Our company systematically compares its strategic knowledge and competence to that of its competitors. |
| STRATKM4 Our knowledge and competence management strategy is communicated to employees clearly and comprehensively. |
| STRATKM5 In our company, the responsibility for strategic knowledge management has been clearly assigned to a specific person. |
Appendix A: The measurement items

**To what extent do the following statements on human resources management apply to your company? (1 = completely disagree, 5 = completely agree)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRMREC1</td>
<td>When recruiting, we pay special attention to relevant expertise.</td>
</tr>
<tr>
<td>HRMREC2</td>
<td>When recruiting, we pay special attention to learning and development ability.</td>
</tr>
<tr>
<td>HRMREC3</td>
<td>When recruiting, we evaluate the candidates’ ability to collaborate and work in various networks.</td>
</tr>
<tr>
<td>HRMTD1</td>
<td>We offer our employees opportunities to deepen and expand their expertise.</td>
</tr>
<tr>
<td>HRMTD2</td>
<td>We offer training that provides employees with up-to-date knowledge.</td>
</tr>
<tr>
<td>HRMTD3</td>
<td>Our employees have an opportunity to develop their competence through training tailored to their specific needs.</td>
</tr>
<tr>
<td>HRMTD4</td>
<td>Competence development needs of employees are discussed with them regularly.</td>
</tr>
<tr>
<td>HRMPAPP1</td>
<td>The sharing of knowledge is one of our criteria for work performance assessment.</td>
</tr>
<tr>
<td>HRMPAPP2</td>
<td>The creation of new knowledge is one of our criteria for work performance assessment.</td>
</tr>
<tr>
<td>HRMPAPP3</td>
<td>The ability to apply knowledge acquired from others is one of our criteria for work performance assessment.</td>
</tr>
<tr>
<td>HRMCOMP1</td>
<td>Our company rewards employees for sharing knowledge.</td>
</tr>
<tr>
<td>HRMCOMP2</td>
<td>Our company rewards employees for creating new knowledge.</td>
</tr>
<tr>
<td>HRMCOMP3</td>
<td>Our company rewards employees for applying knowledge.</td>
</tr>
</tbody>
</table>

**To what extent do the following statements on learning practices apply to your company? (1 = completely disagree, 5 = completely agree)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRNMECH1</td>
<td>Our company transfers knowledge from experienced to inexperienced employees through mentoring, apprenticeship and job orientation, for example.</td>
</tr>
<tr>
<td>LRNMECH2</td>
<td>Our company systematically collects best practices and lessons learned.</td>
</tr>
<tr>
<td>LRNMECH3</td>
<td>Our company makes systematic use of best practices and lessons learned.</td>
</tr>
</tbody>
</table>
## Appendix A: The measurement items

### IT Management Practices

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>ITPRACT1 Our company uses technology to enable efficient information search and discovery.</td>
<td></td>
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<tr>
<td>ITPRACT2 Our company uses technology in internal communication throughout the organisation.</td>
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<tr>
<td>ITPRACT3 Our company uses technology to communicate with external stakeholders.</td>
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<tr>
<td>ITPRACT4 Our company uses technology to analyse knowledge in order to make better decisions.</td>
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</tr>
<tr>
<td>ITPRACT5 Our company uses technology to collect business knowledge related to its competitors, customers and operating environment, for example.</td>
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<td></td>
</tr>
<tr>
<td>ITPRACT6 Our company uses technology to develop new products and services with external stakeholders.</td>
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<td></td>
</tr>
</tbody>
</table>

### Organisation of Work

<table>
<thead>
<tr>
<th>Statement</th>
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<td>WORKORG1 Our employees have an opportunity to participate in decision-making in the company.</td>
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<td>WORKORG2 In our company, work duties are defined in a manner that allows for independent decision-making.</td>
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<td>WORKORG3 We enable informal interaction between members of our organisation.</td>
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<td>WORKORG4 Our company organises face-to-face meetings when necessary.</td>
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<td>WORKORG5 When necessary, we use working groups with members who possess skills and expertise in a variety of fields.</td>
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<td>WORKORG6 When needed, our company makes use of various expert communities.</td>
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