

School of Business and Management

Master Degree Programme in Knowledge Management and Leadership

Riina Salmimies

The role of knowledge management and renewal in building innovation performance

Master's thesis

Supervisors and examiners

professor Aino Kianto

post-doctoral researcher Mika Vanhala

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Tämän työn tavoitteena oli selvittää tietojohtamisen eri käytäntöjen vaikutusta oppimiseen, uudistumiseen sekä yrityksen innovaatiokyvykkyuteen. Työssä on keskitytty erityisesti sellaisiin tietojohtamisen käytäntöihin, jotka edistävät oppimista ja uusiutumista yrityksissä. Työssä on käytetty tilastollisia menetelmiä, muun muassa faktorianalyysia, korrelaatioanalyysia sekä regressiota, analysoitaessa 259 suomalaisesta yrityksestä kerättyä kyselydataa niiden tietojohtamisen käytäntöihin ja aineettomaan pääomaan liittyen.

Analyysi osoittaa, että useat tietojohtamisen käytännöt vaikuttavat positiivisesti yrityksen uudistumiseen ja sitä kautta innovaatiokyvykkyuteen. Henkilöstön kouluttaminen sekä parhaiden käytäntöjen kerääminen ja soveltaminen yrityksessä ovat positiivisesti yhteydessä innovaatiokyvykkyuteen. Henkilöstön kouluttamisella on merkittävin suora vaikutus innovaatiokyvykkyuteen ja tässä työssä on esitetty, että koulutuksen tarjoamisen suurin vaikutus on oppimismyönteisen kulttuurin kehittyminen yrityksiin sen sijaan, että koulutuksella pyrittäisiin vain parantamaan tehtäväkenttään liittyviä taitoja ja tietoja.

Henkilöstön kouluttaminen, parhaat käytännöt sekä sosialisatiossa tapahtuva tiedon vaihto ja suhteiden solmiminen vaikuttavat positiivisesti uudistumispääomaan. Työn tulosten perusteella uudistumispääomalla on merkittävä rooli innovaatioiden syntymisessä yrityksissä. Uudistumispääoma medioi koulutuksen, parhaiden käytäntöjen ja mahdollisesti myös sosialisatiossa tapahtuvan tiedon vaihtamisen vaikutusta innovaatiokyvykkyuteen ja on näin merkittävä osa innovaatioiden syntyä yrityksissä. Innovaatiokyvykkyuden osatekijöiden ymmärtäminen voi auttaa johtajia ja esimiehiä keskittämään huomionsa tiettyihin tietojohtamisen käytäntöihin edistääkseen innovaatioiden syntymistä yrityksessä sen sijaan, että he pyrkisivät vain vaikuttamaan innovaatioprosessiin.

ABSTRACT

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The objective of this work was to evaluate the role of a number of knowledge management practices on learning, renewal and innovation performance. The work focuses on knowledge management practices that promote learning and renewal in firms. Statistical methods were used to evaluate survey data collected from 259 Finnish companies. The survey consisted of items on knowledge management practices and intellectual capital.

This analysis shows that a number of knowledge management practices are positively associated with renewal capital and subsequently with a firm's innovation performance. Training of staff and collecting and employing best practices positively affect innovation performance. This work suggest that systematically providing training to staff promotes a strong learning orientation and communicates a culture of learning.

Training of staff has the most significant direct effect on innovation performance. Training of staff and collecting and employing best practices as well as sharing of knowledge and building relationships during socialization of new employees in turn positively correlate with renewal capital. According to the results of this work renewal capital has a significant role in innovation performance in companies. Renewal capital mediates the relationship between training and innovation performance and between collection and employment of best practices and innovation performance. Renewal capital is thus an important piece of innovation performance. Understanding the antecedents of innovation performance can help managers focus their efforts to specific knowledge management practices that promote innovation performance in their firms instead of just trying to manage the innovation process itself.

We all have the makings of a star.

FOREWORDS

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With warm and heartfelt thanks

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SYMBOLS AND ABBREVIATIONS

ANOVA	Analysis of variance
CFA	Confirmatory factor analysis
EC	Entrepreneurial capital
EFA	Exploratory factor analysis
EO	Entrepreneurial orientation
HC	Human capital
HRM	Human resource management
IC	Intellectual capital
KBV	Knowledge based view of the firm
KM	Knowledge management
KMO	Kaiser-Meyer-Olkin
ORC	Organizational renewal capital
PCA	Principal component analysis
RBV	Resource based view of the firm
RC	Relational capital
SC	Structural capital
TC	Trust capital
VIF	Variance inflation factor

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1 INTRODUCTION

In the past decades the pace of environmental change has increased significantly. Changes in the environment are accompanied by changes in organizations attempting to respond to e.g. changing customer needs, economics, legislation, politics or societal needs. Organizational change has attracted significant academic attention since the 1990s (Porras & Silvers, 1991; Dunphy, 1996; Grant, 1996; Volberda, 1996; Weick and Quinn, 1999). The increasing interest towards change is not due only because of the pace of change but because responding to changes is argued to be a key to competitiveness.

Theories of the firm (e.g. the resource-based theory of the firm and the knowledge-based theory of the firm) explaining the key source of competitive advantage have inspired various theories on combining resources. Grant (1996a) has concluded that in order to sustain competitive advantage in dynamically competitive environments a firm needs to innovate continuously. This continuous innovation according to him requires flexibility generated through integrating new knowledge with existing capabilities or changing the patterns for knowledge integration. Both of these mechanisms will result in extended or completely new capabilities. Flexibility has also been argued for by Volberda (1996). What all the research on dynamic capabilities and subsequently flexibility have in common is a **focus on learning** although not always explicitly expressed in the work. An interesting difference between the studies, however, is the apparently different focus on the importance of individuals versus the organization. Whereas Grant (1996a) emphasizes the importance of individuals as the owners of knowledge and the need to integrate individual's knowledge, Volberda (1996) discusses the importance of organizational design, management and organizational conditions.

With the emergence of the knowledge society and the increase in knowledge work both academic and managerial interest towards managing knowledge has increased significantly. Knowledge is increasingly considered a source for competitive advantage. Although the role of management often implies control we cannot overlook the fact that individuals in a knowledge society are not subject to the same control as in the factories

of the past. Management has become less about control and more about motivation, encouragement, liberation, talent development and fulfilling of individual potential.

Consequently, with individuals owning the primary resource for competitiveness – knowledge – managers need to shift their attention towards understanding the mechanisms by which individual and organizational knowledge is leveraged to produce desirable outcomes for the firm. Even identifying those desirable outcomes for which to aim can be difficult. When the price of a component or a product or the costs of their production no longer determine success we need to evaluate what are the indicators we should look for and the actions that we need to take. What is the process or the mechanism, which determines success of an organization today? What is the role of the manager today?

Innovation is thought to be at the heart of competitiveness in our current turbulent business environment, as already explained above. Organizations need to constantly re-invent themselves and their ways of operating. They need to **renew** themselves continuously. However, it is unclear as to what are the specific actions we should take to induce renewal or how renewal is connected with innovation. If we focus on renewal, will innovation follow?

My synthesis is based on several key concepts. In this work:

Learning means a process that results in a change in behavior or in the development of new abilities or knowledge and can be further divided into individual and collectivistic learning. The latter is used synonymously for organizational learning.

Socialization means a process where a new member adsorbs task related information, knowledge on relationships between the members of the organization and knowledge of the history of the organization and builds relationships with other members of the organization. Socialization is seen in this work as a knowledge management practice promoting learning.

Training and development mean activities provided or paid for by an employer to an employee to develop skills and acquire new knowledge to be used at work.

Best practice means a practice, knowledge, know-how, or experience proven as valuable or effective within an organization and that may be applicable in other organizations or units of the same organization. I consider best practice to be about how to do things rather than what things to do.

Renewal means a process by which an organization responds to a changing environment. A closely related concept is renewal capital, which aims at quantifying the capability of an organization to renew itself.

Innovation performance in my work describes the observed performance of the firm in creating new innovations in the areas of new products and services, production methods and processes, management and marketing practices and business models. Innovation performance is not based on secondary data (e.g. number of invention disclosures or patents) in my work but on the subjective perceptions of the informants in the firms.

Knowledge management is a set of practical means of leadership and management aimed at increasing the knowledge capital of an organization and the subsequent capability of creating value from that capital. The means are then called knowledge management practices, or activities, and are defined as being organizational activities that relate to knowledge management and can be observed.

These key concepts are connected to one another as described in Figure 1 and are later discussed in more detail in this context.

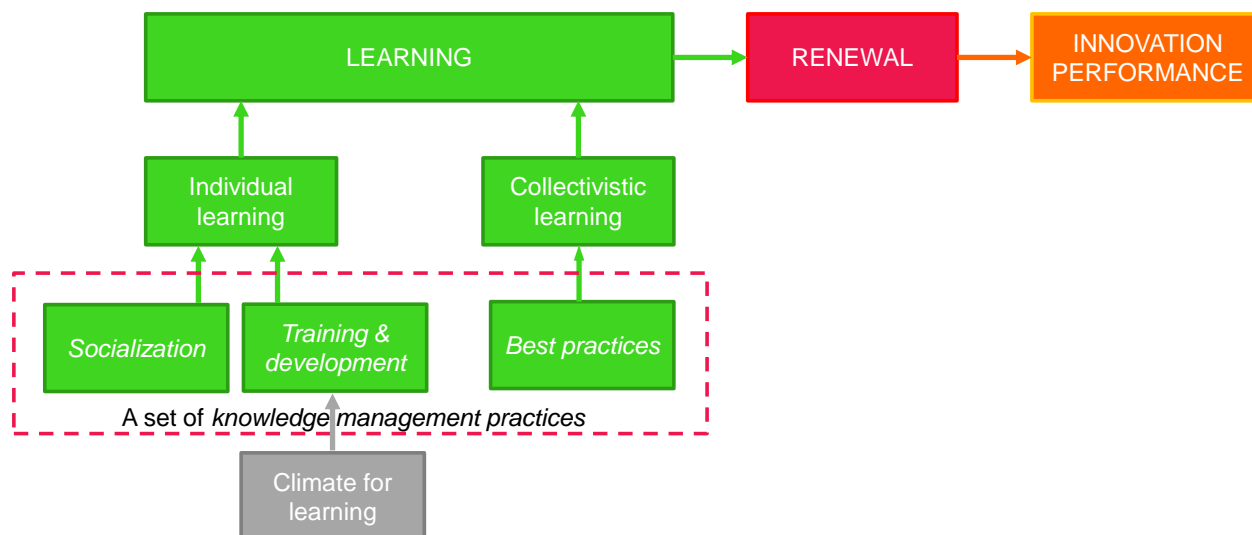


Figure 1. Key concepts of this work and their connections.

This work is grounded in the knowledge-based view of the firm. I focus more on tacit knowledge rather than explicit knowledge subsequently focusing more on the human resources approach to knowledge management rather than the codification approach. I emphasize learning as an over-arching knowledge management practice and renewal capital as an intermediary for innovation performance.

1.1 Research questions and methodology

The main **research question** in my work is:

“How are knowledge management practices promoting individual and collectivistic learning related to organizational renewal and a firm’s innovation performance?”

It is important to remember that different phenomena are at play when investigating learning on an individual and on an organizational level. The processes and the practices need to be different to account for human and organizational factors.

The main research question is broken down into five sub-questions:

- Q1. How does knowledge management of individual and organizational (=collectivistic) learning differ?
- Q2. Which is more important for innovation performance: practices promoting individual or collectivistic learning?
- Q3. What is the relationship between individual and collectivistic learning processes and renewal?
- Q4. Are individual and collectivistic learning processes related to innovation performance?
- Q5. What is the role of renewal in creating innovation performance?

To answer Q1, I cover literature on individual and organizational learning processes, particularly socialization through mentoring and best practices, respectively. This question forms the foundation for Q2 where the importance of both individual and collectivistic learning is examined. To answer this and Q3, Q4 and Q5 I will combine literature with my empirical work to test a number of hypotheses. To formulate the hypotheses requires covering literature on renewal capital and innovation performance.

Although changing the level of observation is often seen difficult, here I am merely making comparisons between two schools of thinking rather than trying to combine individual and collectivistic learning processes.

To support my theory I did statistical analysis of data collected from 259 companies in Finland. Factor and correlation analyses were used to reduce data and together with regression to investigate the correlations between predictors and to test for the mediation model presented in this work.

1.2 Structure of the work

This work is divided into three main sections covering (1) theory, (2) the empirical work to test the theoretically derived hypotheses and (3) conclusions reflecting on the implications of the empirical findings.

The theoretical section will cover the fundamental developments of the resource-based and the knowledge-based views of the firm to go forward into developing the hypotheses on the effects of specific knowledge management practices on innovation performance. These knowledge management practices include socialization through mentoring, the collection of best practices and organizational encouragement of professional development. Innovation performance of the firm is tied to these knowledge management practices through the concept of renewal capital assumed to be directly connected to innovation performance.

Chapters 6 and 7 are dedicated to describing the data collection and development of constructs as well as the methods used for testing the model and finally the results. Testing the proposed model is done using a data set of 259 Finnish firms obtained in the Tekes funded Intellectual Capital and Value Creation project. I will use statistical techniques in SPSS including principal component analysis, correlation analysis and regression to test my model.

Finally in chapter 8 I will discuss both the theoretical and managerial implications of my work together with identifying the limitations of my work. I will try to make a contribution to the understanding of the link between knowledge management practices and innovation performance and will provide some suggestions for managers.

In this work organizational learning is also referred to as collectivistic learning and socialization is addressed from an organizational and from an individualistic perspective in the theoretical section.

THEORETICAL FRAMEWORK

2 STRATEGIC APPROACHES TO VALUE CREATION

Through the evolution of the Western society and its economies various theories regarding the source of competitive advantage have been developed. Not all these theories are exactly theories of the firm but are developments around the same question: what is the strategy by which an organization can succeed.

Porter (1979) has argued on strategy based on industry structure and positioning within the industry through understanding the **five basic forces**: (1) competitors within the industry, the threat of (2) new entrants and (3) substituting products or services, the bargaining power of (4) customers and of (5) suppliers. The weaker these five forces are the greater the opportunity for a firm. Success according to him comes from understanding external opportunities and threats and positioning the company within the industry in a manner which would result in the most profit. Although his theses on product differentiation and benefits of scale still apply today the nature of majority of work and the pace of change was most likely quite different in the times of Porter in comparison to the 21st Century. With the emergence of the knowledge society other theories regarding value, or wealth, creation have increased in popularity.

The **resource-based view of the firm** (RBV) addresses the logic by which an organization can build competitive advantage from combining internal resources (Barney, 1991; Penrose, 1959). RBV stipulates that firms can be expressed as bundles of resources and that those resources are not evenly distributed amongst firms creating preconditions for competitive advantage. Furthermore, this difference in resources is seen to last adding to the sustainability of the competitive advantage.

The **knowledge-based view of the firm** (KBV) is a derivation of the RBV with an emphasis on knowledge as the primary resource for value creation and sustained competitive advantage. The KBV is underpinned by the assumption that a firm exists to

leverage knowledge to create value. Grant (1996b) has argued that organizations exist because of their ability to create conditions for the sharing of expert knowledge to produce goods and services. With acknowledging that the organization might not own its most valuable resource, i.e. knowledge, he emphasizes the need for KM practices. It is important to note that Grant (1996b) as well as Kogut & Zander (1992) both emphasize the meaning of individuals as owners of knowledge and thus their importance in defining the purpose of an organization. This is contrary to many other scholars, who argue on behalf of value creation purely on an organizational level.

Both RBV and KBV are underpinned by the assumption of a firm being able to generate sustained competitive advantage through resources which are valuable, rare, inimitable and non-substitutable (i.e. VRIN attributes). This assumption is also integrated in many other theories deriving from RBV and KBV.

This work is grounded in KBV. Knowledge is seen as the primary asset of an organization in its value creation process and following Grant (1996b), Kogut & Zander (1992) and Nonaka & Takeuchi (1995) I emphasize the significance of the individual as the owner of that asset. This is not to say that knowledge or even an individual's self would not have a social dimension but to build on the need of individuals to even have a social context (= an organization).

2.1 Nature of knowledge

In this work I am adopting the constructionist perspective of Nonaka et al. (2000) on the nature of knowledge. Defining knowledge as a justified true belief I am considering the subjective and changing nature of knowledge. Although we are comfortable within some fields of science (e.g. natural sciences and engineering) with considering knowledge as the cognitivists see it – objective and universally true – a significant quantity of knowledge within organizations is subjective to personal experience and beliefs within the organization. It is also important to acknowledge that knowledge is part of a hierarchy including data, information and knowledge. Out of these three knowledge is of the highest

hierarchy. Knowledge is information placed in a context. Whereas information can be fairly generic, knowledge is information given meaning.

In addition to knowledge being part of a hierarchy knowledge can be divided into two types: tacit and explicit knowledge. These two are distinctly different influencing processes of transfer, creation and use.

Explicit knowledge can be expressed in formal language and is easily codified and recorded into data bases and documents. Extracting, processing and further storing explicit knowledge is also fairly easy. Explicit knowledge in organizations can be identified in manuals, instructions, scientific publications and reports and written communications.

Tacit knowledge in turn is highly subjective because it is often connected to experience. This connection with practice also makes it difficult to formalize tacit knowledge or build data bases out of it. Tacit knowledge is often referred to as being sticky: it is difficult to transfer tacit knowledge. This stickiness results in difficulties in dissemination but also protects the knowledge in an organization from competitors. To transfer tacit knowledge, we often need to move the actual owner of the knowledge – a person.

Organizational knowledge can be defined as a function of the nature of knowledge (tacit/explicit) and the nature of the context (individual/social). The tacit and explicit knowledge on an individual level are automatic and conscious knowledge, respectively, and on a social level collective and objectified knowledge, respectively (Spender, 1996).

A significant distinction similar to the level of observation is the **locus of knowledge**. Two perspectives are dominant: the individual and the collective, or organizational. The locus of knowledge defines at which level is new value created. The locus of knowledge is an important aspect to consider as it provides the answers to a number of questions regarding innovations, new knowledge creation and knowledge transfer. Felin & Hesterly (2007) have extensively reviewed extant literature to argue on behalf of the individual locus of knowledge. They have concluded that the core self would be a primary

determinant of learning and knowledge outcomes. To make the matter more complex Van de Ven & Poole (1995) have described a set of theories of organizational change where change motors can be nested within one another. This nesting effect would indicate the need to acknowledge both organizational and individual drivers at the same time – not just one over the other. Both perspectives of individual and collective have been argued for but joint understanding still seems to be missing making the locus of knowledge and learning an interesting target for study.

2.2 Knowledge-based view of the firm

The knowledge-based view – or theory – of the firm, KBV, forms the foundation of my work. As already mentioned earlier, the knowledge-based view of the firm is an extension of the resource-based view of the firm, RBV, where the core of sustained competitive advantage is formed on valuable, rare, inimitable and non-substitutable resources (VRIN resources). Indeed, Conner and Prahalad (1996) have clearly stated that they are developing “a resource-based theory of the firm. (p. 477)”, i.e. *one* resource-based theory of the firm.

The distinction of the knowledge-based view of the firm is that knowledge is considered the ultimate VRIN resource upon which sustained competitive advantage can be built. Knowledge, then in turn, is argued to be a most difficultly imitable resource. Especially tacit knowledge due to its nature is difficult to transfer without transferring the host. This difficulty manifests itself in today’s society as competition over the best employees and headhunting for them for positions of great importance.

Whether or not KBV is a theory or not has drawn some attention between scholars. For example Foss (1996a, 1996b) has concluded that although some of the aspect of knowledge might be valuable in explaining how firms work they are not sufficient in explaining the very existence of firms. In his reasoning Foss is building on a very strong contractual and economic approach to organizing rather than a complex value creation approach. Nevertheless, it is important to note that also criticism on whether or not KBV

can be used as a theoretical framework exists. It is also worth noting that Conner and Prahalad (1996) have said that KBV is a complementary rather than a competing theory on why firms exist. It is not to replace transaction cost theory.

3 THE INTELLECTUAL CAPITAL FRAMEWORK

Because the existence of intellectual capital, IC, and its worth in value creation are fundamental assumptions underpinning the KBV, I will shortly introduce the concept of IC and its various aspects.

IC is one form of capital of an organization and it is accompanied by physical capital (e.g. buildings, machines and equipment, natural resources) and financial capital (e.g. cash and investments). We can also define intellectual capital by defining what it is not. Intellectual capital is not tangible. It cannot be seen or objectively defined. It cannot be explicitly transferred with a known transaction cost. Further defining tangible assets as something that can easily be bought and sold, as something that is consumed in use and as something that is just as difficult to replicate as it is to create we provide additional characteristics to *intangible* assets, or intellectual capital: they are the opposite. Aspects of ownership and measurement are more complicated with intellectual capital due to the characteristics described above.

However difficult to conceptualize explicitly, the need to measure and explain the effect IC has on competitiveness and value creation has prompted a massive number of scientific papers and other publications on how to classify and measure IC. Edvinsson & Malone (1997) have introduced probably the most well-known categorization of IC utilizing two major classes: (1) human capital and (2) structural capital. With further developments the standard emerging from the literature seems to be a division into three classes, which are found in all developments: (1) human capital, (2) structural capital and (3) relational capital (or social capital). Relational capital then breaks down to account for internal and external relational capital. When going further and classifying different elements of IC under the different categories presented here, I realize that the classification in many

cases is somewhat arbitrary and that the different categories are strongly tied together with one defining the other.

Human capital, HC, can be understood as the capabilities, skills and knowledge of employees of an organization. Contrary to many traditional assets, HC cannot be owned by the organization but the organization has to rely on the willingness of individuals to contribute in creating the value the organization sets out to create. This is where another component of HC comes into play: values, culture and philosophy (Edvinsson & Malone, 1997). According to Marr (2008) culture, values and management philosophy are components of structural capital, not human capital, but having discrepancies between different authors and ways of classifying are quite common in literature.

Structural capital, SC, describes all the elements left at the work place when the employees go home at the end of the day. It constitutes organizational structures, hardware, software, databases, patents and trademarks, processes and routines. An interesting component of SC is the ever-increasing intellectual property. Although this is something an organization can explicitly own, it would often not exist without human capital. This means that SC, although a self-standing category, is tied to the very existence of human capital. The same applies for many other elements of SC. An example is culture, discussed above and argued by Marr (2008) to be part of SC, which without human capital would not exist and can quite easily be considered a social construct.

Relational capital, RC, constitutes relationships on several systemic levels: individuals, organizations, institutions. These relationships include for example customers, employees, suppliers, the media, legislators, competitors, different communities and investors. RC can further be broken down to internal and external relational capital. Internal relational capital includes relationships between individual employees, between different units and functions. External relational capital in turn describes the relationships the organization or its employees have with those outside the organization.

Although the division into three elements could be seen as the emerging standard of intellectual capital, there are also more recent developments amending this division with three more elements: organizational renewal capital, trust capital and entrepreneurial capital.

Ståhle and Grönroos (2000) have addressed **organizational renewal capital (ORC)** as a key component of intellectual capital. ORC draws from an organization's capability for renewal and is grounded in the construct of dynamic capabilities. The emergence of ORC as part of IC is for certain a response to the increase in pace of change. After all, Ståhle et al. (2003) have developed ORC based on "the qualities and processes by which a company masters transformations and survival in complex dynamic environment (p. 22)". Academic literature on the importance or the influence of ORC on firm performance is, however, scarce.

4 KNOWLEDGE MANAGEMENT AND PERFORMANCE

Knowledge management is a systematic process building on practical means of leadership and management and aimed at increasing the knowledge capital of an organization and the subsequent capability of creating value from that capital (Ståhle & Hong, 2002). Knowledge management practices, or activities, are then defined as being organizational activities that relate to knowledge management and can be observed. The definition and four key dimensions related to performance have been provided by Zack et al. (2009). The four dimensions are: (1) the ability to locate and share existing knowledge, (2) the ability to experiment and create new knowledge, (3) a culture that encourages knowledge creation and sharing and (4) a regard for the strategic value of knowledge and learning.

KM practices can be seen in various ways. KM practices can be considered as processes or activities to organize, create and share knowledge to create value on an organizational level. Furthermore, KM practices can be objects of measurement or assessing. KM practices vary from IT assisted to activities of strategic human resource management. Of

course, at the heart of the different KM practices is the fundamental definition of knowledge as being implicit or tacit and these two requiring different approaches of management. Although considered as processes, it is important to remember that KM processes do not equal to knowledge processes, which could be considered as organic processes of knowledge creation and sharing and are not subject to managerial control.

To justify the use of resources on KM activities it is important to understand the effects KM has on organizational performance. Leveraging IC and influencing value creation through KM practices are partially divided into two different research strands. However, some research suggests that IC and KM practices are linked to create value. It is easy to find scholarly literature to argue on behalf of the relationship between KM and firm performance or KM and IC. The studied models are diverse with Hermans & Kauranen (2005) arguing on behalf of anticipated sales being explained by both individual variables of HC, SC and RC but also by interaction variables obtained through factor analysis. In turn, Cohen & Olsen (2015) testing the universalistic, contingency and complementary perspectives on knowledge management capabilities and firm performance in the South African hospitality services sector found that KM capabilities have an influence on firm performance but that the influence of different KM practices would be dependent on the **business strategy** of the firm and the consequent performance targets. Further into explaining the relationship of KM and financial performance Zack et al. (2009) have suggested the relationship between KM and financial performance to be **mediative** with KM being related to organizational performance which in turn was related to financial performance. Here KM practices were tied to four key dimensions: (1) locating and sharing knowledge, (2) experimentation and creating new knowledge, (3) an encouraging culture and (4) appreciation of the strategic significance of knowledge and learning in general. This relationship of performance and financial performance is similar to what Andreeva & Kianto (2012) have later proposed. To support the hypothesis of a mediative role Hsu & Sabherwal (2012) have argued that neither IC nor KM directly influence financial performance measured through return on assets and earnings per share but rather influence it indirectly by influencing dynamic capabilities, innovation and efficiency in different ways. Dai et al. (2015) have, in turn, argued for a **moderating role** when studying

the influence of social capital on financial performance in the Chinese hospitality sector. The interaction between internal and external social capital had an effect on financial performance of a firm and the promotional effect was further enhanced by innovation and corporate venturing activities.

Several limitations have been identified in previous literature and have inspired wider empirical investigations on KM practices and organizational performance. Andreeva and Kianto (2012) have pointed out that research is often done by collecting data from a single country thus undermining the applicability of the results in other economic and social contexts. In addition to being limited in economic and social context, research on the influence of IC and KM practices often focus on industries apparently knowledge intensive, e.g. high-tech industries or manufacturing. However, diversification has been apparent in the past few years as hospitality, banking and various other sectors have also been included in research.

With so much literature to argue for the connection, the question remains as to why KM and firm performance are connected. In this work I am adopting one of the four proposed models of Kianto et al. (2004): the effect of KM practices on organizational performance is mediated by IC assets. To argue on behalf of my model, I will take you through various learning mechanisms, introduce ORC into the model and finally propose a model where ORC and innovation performance mediate the relationship between KM practices focused on learning.

4.1. The multiple facets of learning

In the 21st Century the knowledge, skills and competence of employees has increased in importance. Even more important would still seem to be continuous development and learning so that employees and an organization collectively could respond to the changes in their business environment and remain competitive and innovative (Salas & Cannon-Bowers, 2001).

Learning is according to the Oxford dictionary “the action of receiving instruction or acquiring knowledge; [...] a process which leads to the modification of behavior or the acquisition of new abilities or responses”. Learning, however, should not be considered as a homogeneous single phenomenon. It happens on various levels and through various mechanisms. Not all those mechanisms may be useful or even desirable for organizations competing in the current business environment.

The definition of learning refers to the acquisition of knowledge bringing us back to the need to understand the creation and sharing of knowledge. The SECI process from Nonaka et al. (2000) describes the creation of knowledge through four activities: socialization, externalization, combination and internalization. Differences in the four activities arise from the knowledge shared and the knowledge created being either tacit or explicit. Socialization is often about sharing tacit knowledge between individuals or entities. Externalization is the expression of tacit knowledge to create explicit knowledge whereas internalization happens in the opposite direction. Finally, combination is literally the combining of explicit knowledge to form new explicit knowledge. Although we talk about the creation of new knowledge it is obvious looking at the definitions of socialization, externalization, combination and internalization that the knowledge created might not always be universally new. It can, however, be new to the individuals involved in the process followed by the recognition of the locus of knowledge.

Sheng & Chien (2016) have shown a link between learning orientation and innovation capabilities. Their analysis is more focused on how learning orientation affects incremental and radical innovation rather than what the link between learning and innovation performance is. Nevertheless, their work confirms that there is a relationship to study.

4.1.1 The role of socialization in learning

Organizational socialization is the process of “learning the ropes”: becoming aware of the value system of the organization, understanding the history and power structures of the

organization and adopting specific behaviors, language and symbols of the organization. In at least one crucial way organizational socialization resembles the socialization of the SECI-process from Nonaka et al. (2000): sharing of tacit knowledge takes place. Organizations employ different tactics in socialization. Depending on whether they employ individualized or institutionalized tactics and/or formal or informal tactics the parties involved in the socialization process can differ. Individualized informal tactics stress personal relationships where socialization happens between a mentor and the employee, often resembling that of apprenticeship. Institutionalized formal tactics include formal orientation programs where the socialization could be seen to take place between the organization and the employee through explicitly designed socialization processes. One of the major differences originating from these tactics is the extent of control. An organization has more control over its institutionalized socialization processes than it does over mentoring and other forms of informal socialization (Cooper-Thomas, 2006). In addressing socialization as a learning process I consider the locus of knowledge to be an individual employee and socialization to be a process aimed at changing that knowledge.

Darroch (2005) has presented that firms developing disruptive innovations would not have any more well-developed knowledge management practices than others. The question then arises as to why these firms would nevertheless seem to be more innovative than others.

Considering that in general better developed knowledge-management practices would not result in better performance it is interesting to look at the role of the socialization process in organizations as hindering innovation and learning rather than aiding it. According to Calantone et al. (2012) for innovation to happen accepted norms, beliefs and practices may have to be challenged. Rebernik & Karin (2007), in turn, have argued that socialization can hinder innovation and thus it would seem important to acknowledge the homogenizing effect of socialization. Indeed, Cooper-Thomas & Anderson (2006) have noted that it is possible that newcomers become overly socialized subsequently leaving no room for innovation. Drawing from psychology and especially from interpersonal processes to explain behavioral confirmation Snyder & Stukas (1999) have reviewed

literature to argue for the influence of power in relationships. Because of the distribution of power between a new employee and an established member of the organization – or even a supervisor – I am assuming the new employee to be subject to the expectations of the other member. These expectations can according to Snyder & Stukas (1999) influence the new employee's behavior. Brown & Duguid (2001) have in turn explained that in communities of practice, one's professional identity is partially constructed on recognition by peers. It is not difficult to hypothesize that the same would apply within organizations where a new member is recognized as part of the community only after being accepted by peers as such. Furthermore, I would assume that this recognition requires the newcomer to adopt certain ways of thinking and doing simultaneously rejecting unconventional thinking. Schulz (2001) has also found evidence to support his hypothesis that larger inflows to a sub-unit result in weaker outflows from that unit. The hypothesis is based on substituting one learning mechanism by another and in worst cases can result in learning coming to a full stop altogether. If this can happen within organizational units, why not in new employees as well as they are fed knowledge by those of higher position or through formal orientation programs? This line of thought brings us back to tacit knowledge and socialization becoming barriers for new ways of thinking. McMillan-Capehart (2005) have actually argued for more individualized socialization tactics for an organization to truly benefit from diverse thinking while alleviating conflict arising from diversification amongst its human resources. This argument is supported by the conclusions of King et al. (2003) that using standardized socialization tactics might not always be the best solution.

Despite the fact that socialization can result in unwanted effects we should not overlook the importance of socialization altogether. Cawyer et al. (2002) have studied the socialization process of new faculty members and have concluded that receiving professional advice is merely one of the characteristics of mentoring relationships. The other four characteristics are interpersonal bonding, social support, sharing of history and accessibility of support. When looking at the five characteristics, most of them are actually about building relationships and understanding the social environment the new member has entered. Rather than receiving task-related advice information is exchanged on past

events affecting the organization and on social encounters with other members of the organization. Although socialization is very much a learning process, characterized by the vast quantity of research defining various learning domains within socialization (e.g. Ostroff & Kozlowski, 1992; Chao et al., 1994; Taormina, 1994, 1997, 2004; Thomas & Anderson, 1998), socialization is much more than just a process of transferring information. It would be very difficult to explain the findings of Arling & Chun (2011), that employee socialization cannot happen through information technology, if we were to consider mere transfer of information. After all, what we can speak out can often be codified and transferred using computer tools. Consequently, what we cannot externalize seems to play an important role in socializing a new employee as information technology is unable to replace human interaction. Feeling valued as an organizational member, gaining increased self-efficacy and building reciprocal relationships with other members of the organization can be important outcomes of socialization and thus specific activities to promote socialization can have positive effects in organizations.

With this development I hypothesize that

H1 The transfer of knowledge occurring during e.g. mentoring is positively linked with renewal capital.

Mentoring as a form of socialization strengthens the bond between the individual and the rest of the organization. The transfer of knowledge in this case has less to do with the development of task-related skills and expertise and more to do with understanding the organization the junior employer has entered.

4.1.2 Best practices – learning or not?

Before going into discussing best practices and their connection with learning it is important to define best practices for the purpose of this work. The Oxford dictionary defines best practices as the “commercial or professional procedures that are accepted or prescribed as being correct or most effective”. This definition still requires quite a bit of

elaboration to be helpful for my work as research considers best practice to be everything from HR to individual activities of work orientation. When looking into the literature on knowledge transfer in organizations I find that best practice can be perceived as being “any practice, knowledge, know-how, or experience that has proven to be valuable or effective within one organization that may have applicability to other organizations” (O’Dell & Grayson, 1998, p. 167). Proven in this case means that at minimum process performance data has been used to evaluate the goodness of the practice. In my work I consider best practice to be a description of *how* to do specific things rather than *what* specific things to have. In practice the latter supersedes the first as stipulated by Perrin et al. (2007) in formulating that best practice means doing the right thing right.

In contrast to socialization the collection and employment of best practices does not represent the learning of an individual but rather that of an organization. This focus is reflected also in the work of O’Dell and Grayson (1998) although they do explain that individual willingness is also important in transfer of best practices. Thus in addressing the collection and employment of best practices as a learning process I consider the locus of knowledge to be an organizational unit and the collection and employment of best practices to again be a process aimed at changing that knowledge. Subsequently, learning is considered from an organizational perspective here.

In discussing organizational learning it is important to understand that it has multiple levels and that multiple interpretations have been presented in literature as the review from Fiol & Lyles (1985) shows. Whether organizational learning should be understood as everything between behavioral adaptation to understanding of causal relationships and fundamental change of underlying beliefs or just as one of these is not in the focus of this work but provides an interesting starting point for reflecting the nature of best practices. I am focusing on a specific mechanism of organizational learning, which would most likely fall into the categories of behavior development and lower-level learning according to Fiol & Lyles (1985). Cognition development and higher-level learning would require a process of transformation of fundamental perceptions and joint understanding within the organization. The collection and employment of best practices hardly measures up to such

a transformation. Subsequently, best practices as a KM practice reflects only two types of organizations according to Fiol & Lyles (1985): bureaucratic firms where no learning really takes place and firms where changes are implemented but with little actual learning.

Although the concept of a learning organization (Armstrong & Foley, 2003; Senge, 1990) has increased in popularity and has been linked to innovation and performance by various authors (e.g. Ho, 2011; Power & Waddell, 2004) it is worth remembering that in a learning organization thinking patterns truly change. Cognitive development is one of the major hallmarks of a learning organization. As a child mimics an adult without understanding why the adult behaves in a certain way, can an organization mimic another or a subunit employ the same practices as another without understanding why. As I am arguing best practices not to describe such in-depth organizational learning, I will not go into details on cognitive development or the learning patterns of a learning organization.

Darroch (2005) has argued that out of the three components of knowledge management, i.e. knowledge acquisition, knowledge dissemination and responsiveness to knowledge, only responsiveness to knowledge is directly correlated with performance. This would mean that collecting knowledge – or best practices – alone does not result in increased performance. This assumption is supported by Zahra & George (2002) who have argued that acquisition alone cannot result in performance outcomes and exploitation is not possible without acquisition. They have proposed absorptive capacity – a dynamic capability to create and utilize knowledge – to consist of four dimensions: acquisition, assimilation, transformation and exploitation. These four dimensions in turn form two subsets of absorptive capacity: potential absorptive capacity and realized absorptive capacity. Potential absorptive capacity reflects the capabilities of a firm to acquire and process new information whereas realized absorptive capacity is a function of transformation and exploitation. Performance cannot be enhanced without both of the subsets active.

The employment of best practices is underpinned by the assumption that there is a “one-size-fits-all” solution or that business problems are generic. Best practices reflect solutions that work in specific context and often are retrospective.

In contrast to the above argumentation Eisenhardt and Martin (2000) have identified best practices across firms when developing their perception of dynamic capabilities. They have argued that there are better and worse ways of executing certain organizational processes. This may just as well be true, but if these “best practices” are common knowledge to the extent that they can be published in scientific literature, how probable is it that these practices would result in competitive advantage apparent in performance. Considering that sustained competitive advantage would require resources with VRIN characteristics, best practices shared by firms within a specific industry would not sound like a combination of resources and/or a result of processes which would be rare or inimitable.

H2 Collecting and employing best practices is negatively linked with renewal capital.

Collecting knowledge alone results in no effect in organizational outcomes. Best practices are based on the assumption of universalistic success models and do not consider contextual effects. Employing best practices equates to mimicking. Learning might have taken place in the organizational unit where the best practice was developed but is not a prerequisite for another unit to employ the same practice. Furthermore, best practices are collected retrospectively and represent what has been found to work in the past rather than what might work in the future considering the turbulent business environment we are facing today. Finally, when assuming that a learning organization would build increased renewal capital it is imperative that the organization exhibits higher-level learning with true cognitive development. Best practices do not reflect this and thus would not correlate positively with innovation performance.

4.1.3 Enabling a climate for learning

Culture, synonymous to climate in my work, is an extensively studied phenomenon also in an organizational context. Barney (1986) defines culture as “a complex set of values, beliefs, assumptions and symbols that define the way in which a firm conducts its business (p. 657)”. This complex set could be considered an ultimate example of tacit knowledge, which we act on daily.

According to the theory on a learning organization, the organization has a role in enabling a climate for learning. This climate for learning is often also synonymous or at least strongly associated with organizational culture constructed of a number of factors (e.g. Flores et al., 2012). A common concept in connection to learning and organizational culture is **learning orientation** reflecting the tendencies of a firm to create and use knowledge (Hanvanich et al., 2006). According to Hurley and Hult (1998) strong learning orientation endorses and encourages learning within the organization and can lead to the development of individual skills and subsequent integration of new skills and knowledge in the organization. The role of the organization is often facilitated by human resource management (HRM) with various systematic processes. This enabling climate is not just about organizational processes but is intertwined with trust, empathy, help and leniency in judgement. All of these aspects together have been named ‘care’ by von Krogh (1998).

The question then remains: how to enable this climate for learning and encourage a strong learning orientation through KM practices? There are of course a number of ways but I have chosen one of the most obvious ways because of the significant resourcing of this practice: **training**. I have chosen to study the influence of specific HRM practices regarding training and development and am proposing these HRM practices to be activities designed to foster a strong learning orientation and to subsequently produce competitive advantage. Thus I have chosen an organizational perspective to start with.

Considering the organization’s point of view I need to draw from the strategic management literature to develop my theory. From the point of view of an organization developing firm-

specific human capital can provide a strategic advantage over competitors and thus on-the-job training and development can become economically attractive to employers (Becker, 1975). Developing human capital through training is underpinned with the assumption that the function of training is to develop the task-related skills of the employee and thus increase productivity (Goldstein, 1980). Nevertheless, research increasingly emphasizes the meaning of a learning-oriented culture, too (Jerez Gomez et al., 2004). In addition to improving individual skills communicating a culture of learning is psychologically important.

Although literature has often assumed that training would have a direct effect on performance outcomes (Aguinis & Kraiger, 2009; Aragon et al., 2003; Ballesteros et al., 2012; Salas & Cannon-Bowers, 2001; Submaranian & Youndt, 2005), lot of the empirical work done on the topic does not provide evidence to support it (Black & Lynch, 1996; Krueger & Rouse, 1998; Schonewille, 2001). Furthermore, Tharenou et al. (2007) have criticized in their review that although substantial resources are invested in training, most organizations do not evaluate the effects of training on results and that scientific literature on the effects of training on organizational outcomes is lagging behind that of individual outcomes. The model developed by Tharenou et al. (2007) resembles my own: training is thought to produce HR outcomes, which produce organizational performance outcomes. Some evidence to support mediation of the relationship between training and financial outcomes has been previously presented (Faems et al., 2005). Empirical evidence has shown that firms investing in developing their firm-specific human capital through a comprehensive set of actions (Snell & Dean, 1992), including training, would have higher productivity and would be more successful in implementing organizational improvement. With a fair number of studies it is still unclear as to how training contributes to organizational outcomes.

Even with focusing on the organization's point of view in enabling a climate where learning is encouraged, we do need to remember that providing mere tools for learning might not be sufficient. I need to embrace a more behavioristic approach if I wish to proceed to argue on behalf of HR contributing towards increased affinity for learning. If I were to

consider an individual's perspective on training and development I might argue on basis of the social exchange theory where both parties, the individual and the organization, would engage in reflection of benefit and might finally come to a conclusion on training being mutually beneficial. This perspective certainly brings about major differences between the motives of individuals and HR policies of organizations. Subsequently, other practices e.g. rewarding employees for developing their skills become important practices of HRM too as compensation can have a positive impact on an employee's post-training motivation to share knowledge (Chen & Klimoski, 2007).

Aragon et al. (2014) have shown that training does not directly influence performance but that the relationship is mediated by organizational learning. This mediating effect has similarities to what I am proposing: training alone does not equate to performance but builds on intermediate outcomes that positively correlate with performance.

Whereas training is traditionally considered to have a positive impact on an employee's skills and task performance, I propose that the overall notion of training accompanied by a notion of continuous improvement and adsorption of new knowledge drives organizational renewal when systematically applied. Differing from the logic of various authors I propose that the primary function of offering training and development is not to develop task-related skills but to foster a climate non-verbally communicating the importance of improvement. This approach finds some support in the work of Zack et al. (2009) who have pointed out after a thorough literature analysis that one of the key dimensions of KM practice is a culture that encourages knowledge creation and sharing. Training in my case is the KM practice that represents the search for strong learning orientation and a climate for learning. Whereas developing task-related skills might not result in organizational renewal, as training can be poorly designed, might not be suited for the needs of the employee or simply might not transfer into the work, systematic offerings of training communicate an organizational value building the ORC of the firm.

To summarize I hypothesize that:

H3 Training and development is positively linked with renewal capital.

4.2 Renewal capital as the missing piece

Learning as such is a broad and complex concept and cannot be translated into measurable capital to evaluate the relationship between KM practices and firm performance. Thus I still need to seek an appropriate manifestation of learning and have selected organizational renewal capital (ORC).

Considering the previously presented definition of learning it is not difficult to hypothesize that learning and ORC would be connected. Learning according to the definition integrally incorporates a change in how we respond to various events around us and renewal capital as a concept has been developed to explain how organizational adaptation to a rapidly changing environment is crucial for long-term performance. For adaptation to take place, learning has to happen first. Although the levels of observation may be different for learning and ORC – individual vs organizational – and that scholars have yet to come to an agreement on the link between individual and organizational learning it is still easy to wonder to what extent this very fundamental individual process of learning creates organizational renewal. Orlikowski (2002) has argued that organizational renewal happens as a result of daily activities of the organizational members. As individuals make up an organization there has to be a point where the sum of individuals translates to organizational phenomena: I am arguing that point to be where individual learning translates to ORC. Many scholars have focused merely on learning processes trying to clarify as to how individual and organizational learning influence performance (Bapuji & Crossan, 2004; Molina & Callahan, 2009) and how individual learning translates to organizational learning (Casey, 2005; King, 2001; Bogenrieder, 2002; Chan, 2005). I in turn argue that ORC is one of the key constructs in explaining firm innovation performance. On an organizational level Crossan et al. (1999) have actually identified organizational learning as the mechanism by which renewal of a firm happens and thus I am encouraged to follow the same line of thought.

Kianto (2008) has successfully summarized how organizational renewal has actually been addressed by several disciplines and with varying focus within business literature. As her focus was not so much on analyzing the actual relationship between renewal capital and learning this relationship has not been addressed in her work.

Caloghirou et al. (2004) and Cassiman & Veugelers (2006) have empirically shown that in addition to performing R&D and employing highly-skilled people acquiring knowledge from external sources is required to increase innovation performance. This finding has been supported by various research on strategic alliances and interfirm co-creation and is interesting because entry of new employees could also be seen as an external source of new information and knowledge – at least until the point where the new member becomes socialized and that advantage is lost. Huber (1991) has covered this phenomenon (grafting) in his review and has indicated that empirical work on the matter is scarce. In most cases entry of new employees is, however, not considered as a source of external information.

Knowledge sharing during learning does not necessarily lead to increased performance but can lead to other intermediary outcomes which then lead to increased performance. I argue the first intermediary outcome to be ORC instead of innovation performance or capability and innovation performance to then be positively influenced by ORC through mediation. For testing I propose the following hypotheses:

H4 The relationship between transfer of knowledge and innovation performance is mediated by renewal capital.

H5 The relationship between collecting and employing best practices and innovation performance is mediated by renewal capital.

H6 The relationship between training and development and innovation performance is mediated by renewal capital.

4.3 Innovation as means for value creation

In many businesses it is an underlying assumption that the more innovative the firm is the more prosperous it will be. In a rapidly changing business environment it is easy to hypothesize that organizations responding fast to changing customer needs and renewing their value offerings by bringing new innovations to the market would succeed over those less responsive and innovative. Considering that many theoretical aspects, e.g. dynamic capabilities, organizational renewal and KBV altogether, have been developed to understand the mechanisms and preconditions of value creation it is easy to argue on behalf of the connection between innovation and financial performance. After all, innovations – whether they be product or service innovations – are what customers pay for and internal process innovations can, in turn, lead to reduced costs and higher production efficiency. In this work I assume innovations to be generated from the knowledge assets and knowledge processes of an organization, as have e.g. Stewart (1997) and Madhavan & Grover (1998).

Innovation has been shown to be linked to business performance by a number of past studies (Damanpour & Evan, 1984; Damanpour et al., 1989; Kotler, 1991; Zahra et al., 1988) and I will use less effort here to argue on behalf of this relationship. Saunila (2014) has also argued and empirically shown that innovation capacity is positively related to financial performance. She has included in her model some interesting aspects, which resonate also with the development of my own theory. In her work innovation capability is constructed of seven aspects out of which know-how development and individual activity merit attention here. Know-how development includes the utilization of knowledge and development of employee skills and is characteristic to an organization committed to learning and development. This definition integrally ties together learning and innovation although the focus was on innovation and firm performance. In turn, in defining individual activity Saunila actually justifies the leap from individual to organizational level. Innovation capability does not exist without the capability of individuals to innovate.

These examples are merely to justify the interest towards innovation. I will not go further into analyzing the relationship between innovation performance and financial performance. However, the (financial) success of the company is, in the end, what innovation performance should also contribute to.

In my work I consider innovation performance to be sufficient enough to reflect innovation in companies but it is worth recognizing that innovation can be broken down to radical and incremental innovation to have an even more fine-grained analysis on the effects of knowledge management on innovation.

5 KNOWLEDGE MANAGEMENT PRACTICES AND INNOVATION PERFORMANCE – THE PROPOSED MODEL

Based on what I presented in sections 4.1 and 4.2, I am proposing the model presented in Figure 2 for testing. I will be testing a number of hypotheses, drawn from the literature and collected below, to evaluate the relationships between a number of KM practices and organizational performance emphasizing those practices, which should promote learning and personal professional development and thus contribute to higher ORC. ORC is considered a mediating factor in my model.

To summarize that presented earlier in chapter 4 the hypotheses associated with the proposed model are:

- H1: Transfer of knowledge occurring during **socialization**, mainly mentoring, is positively linked with renewal capital.
- H2: Collecting and employing **best practices** is negatively linked with renewal capital.
- H3: **Training and development** is positively linked with renewal capital.
- H4: The relationship between socialization and innovation performance is mediated by renewal capital.
- H5: The relationship between collecting and employing best practices and innovation performance is mediated by renewal capital.

H6: The relationship between training and development and innovation performance is mediated by renewal capital.

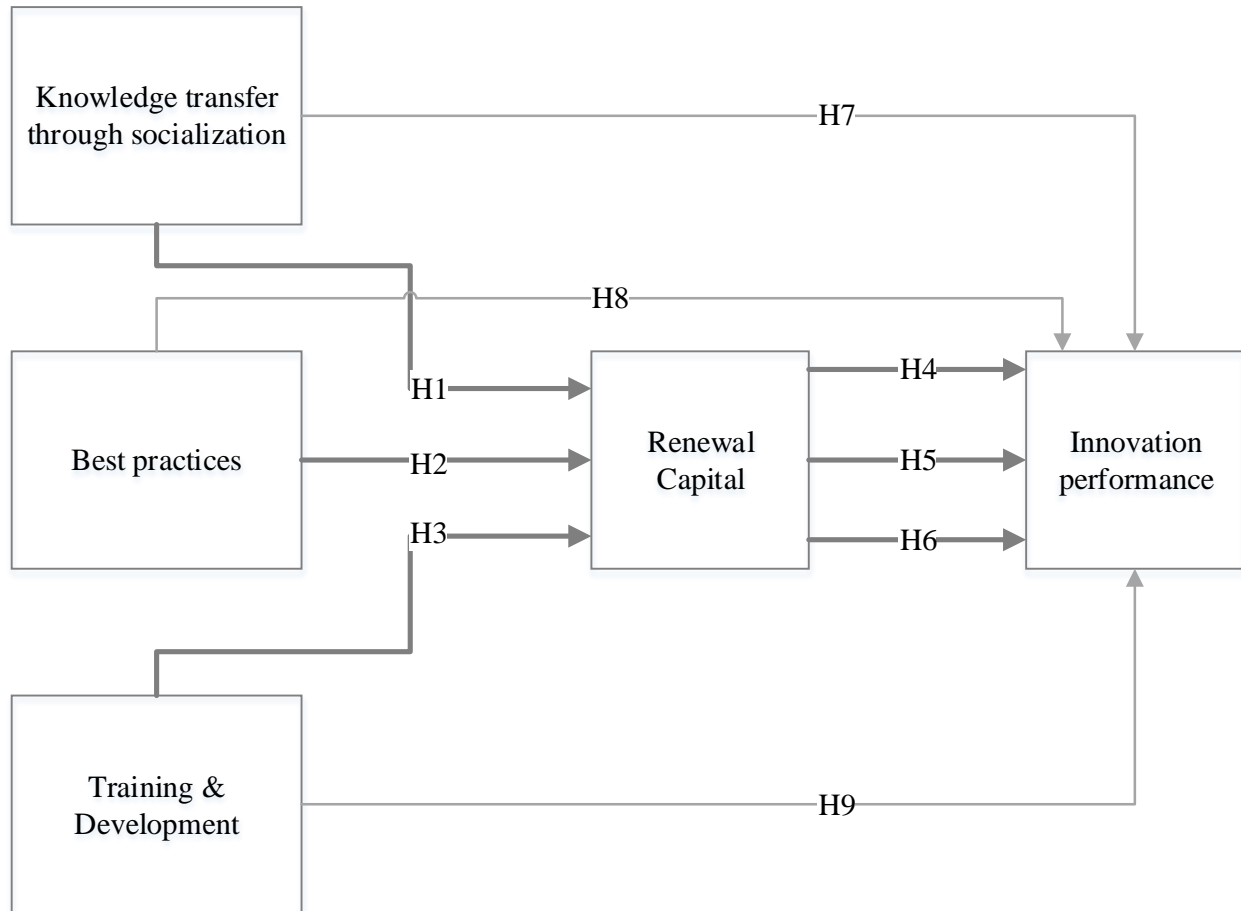


Figure 2. Model linking knowledge management practices for learning and development to a firm's innovation performance.

The above hypotheses are commonly acknowledged paths in mediation models. H1–H3 represent the paths from the independent variables to the mediator and H4–H6 in turn represent the effects of the mediator. Conceptualization of these paths is described in Figure 3.

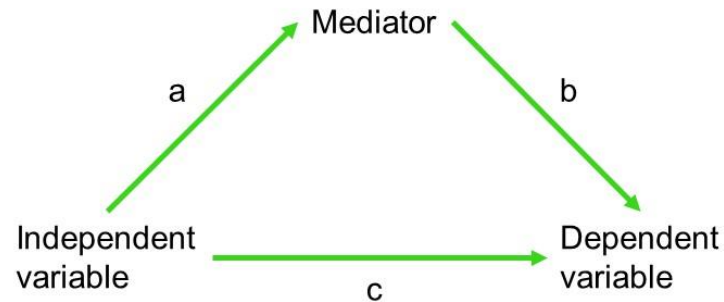


Figure 3. The causal paths of mediation (adopted from Baron & Kenny, 1986). *a* describes the effect of the independent variable on the mediator, *b* the effect of the mediator on the dependent variable and *c* the direct effect of the independent variable on the dependent variable.

In addition to testing the hypotheses above, hypotheses 7–9 indicating direct correlations between the studied KM practices and innovation performance are tested. These hypotheses have been supported by some studies but are not theoretically argued on behalf in this work. Testing of these hypotheses is necessary also from the perspective of the mediation effect that I am arguing for.

The hypotheses are:

- H7: Transfer of knowledge occurring during socialization, mainly mentoring, is directly and positively linked with innovation performance.
- H8: Collecting and employing best practices is directly and negatively linked with innovation performance.
- H9: Training and development encouraging personal professional development is directly and positively linked with financial performance.

The above hypotheses include mechanisms where innovation performance would directly influence the relationship between the various learning processes and innovation performance. This direct path is also a path considered in mediation models (Baron & Kenny, 1986).

EMPIRICAL

6 METHODOLOGY

This section describes the methods for both data collection and statistical analyses used to test the hypotheses. In my work I used data collected during the Intellectual Capital and Value Creation project funded by the Finnish Funding Agency for Innovation. In selecting and applying methods I have drawn advice from Heikkilä (2014) and Metsämuuronen (2005, 2008) but the basics of statistical analysis have been covered by several other authors as well.

6.1 Operationalizing the constructs

As described by Metsämuuronen (2005, p. 102–104) an important part of survey studies is to operationalize the theoretical constructs one wants to study so that they can be measured by e.g. surveys. This operationalization is often done by using measures which other researchers have previously shown to be valid and reliable. Measures are often constructed on multiple questions, or items, to increase the reliability of data. However, not all the items need to be included in the final analysis and often as a result of factorial analysis some are left out.

Operationalizing the constructs and building the measures is very important due to the need for good quality data for further analyses. A model can only be as good as the data upon which it is built and the data can only be as good as the process used to collect it. Here it is important that I admit that for the purpose of my work in addition to using the already formulated measures for innovation performance, renewal capital and training and development – measures proven valid and reliable by others previously – I had to manipulate the measure describing learning in the organization. I split the original measure used in the Intellectual Capital and Value Creation project in half including questions on best practices into one subsequent measure and combined the remaining question on transfer of knowledge with questions on sharing of knowledge by supervisors

and on learning ability in recruitment to form another subsequent measure. Omitting one question out of three in organizational learning might still be acceptable, but the new measure combining knowledge transfer, recruitment and leadership has not been pretested in any way. This treatment is obviously a significant limitation but could not be overcome within the time constraints of this work. To clarify the need for splitting the previously built construct: I consider knowledge transfer from one individual to another as an individual level process whereas the collection and employment of best practices is more an organizational effort. Although knowledge transfer from more experienced employees to new entrées can of course have organizational outcomes – both positive and negative – I argue in chapter 4.1.1 for the primary effects to be on the individual level.

The questionnaire originally developed in the Intellectual Capital and Value Creation project consisted mainly of multi-item measures with some additional background questions. All questions investigating the theoretical constructs were scale questions.

The scale for innovation performance was based on previous work by Weerawardena (2003) where five items were used to test a firm's ability to innovate in comparison to their competitors. The scale for training and development was developed previously by Inkinen et al. (2015). The scale for renewal capital was developed by Kianto (2008).

6.2 Data collection

The data was collected from Finnish companies in 2013 using a structured survey and the key-informant technique. The initial number of appropriate companies ranging in size, age and industry was 1523. The companies were identified using the Intellia database after which an external service provider contacted all the companies and requested for responses from the person in charge of human resources. The survey consisted of 91 questions ranging from innovation and performance to firm intellectual capital and knowledge management practices and were answered on a 5-point Likert scale. In addition information on the position of the respondent and on various basic considerations, e.g. the share of staff involved in R&D and the importance of tangible

resources was collected. The initial questionnaire can be found in Appendix 1. To clarify on the data used for my work Table 1 summarizes the constructs that I have used together with the specific survey items. Factor analyses described later in Chapters 6.3.1 and 7.1 were used to further refine the sum scales from the survey items.

Table 1 Survey items of the original questionnaire used in this work to operationalize the constructs. The questionnaire was developed in the Tekes funded Intellectual Capital and Value Creation project.

Construct	Survey item(s)
Innovation performance	<p>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>INNOPER1 Products and services for customers</p> <p>INNOPER2 Production methods and processes</p> <p>INNOPER3 Management practices</p> <p>INNOPER4 Marketing practices</p> <p>INNOPER5 Business models</p>
Renewal capital	<p>To what extent do the following statements on renewal apply to your company? (1 = completely disagree, 5 = completely agree)</p> <p>RENCAP1 Our company has acquired a great deal of new and important knowledge.</p> <p>RENCAP2 Our employees have acquired a great deal of important skills and abilities.</p> <p>RENCAP3 Our company can be described as a learning organisation.</p> <p>RENCAP4 The operations of our company can be described as creative and inventive.</p>
Training & development	<p>To what extent do the following statements on human resources management apply to your company? (1 = completely disagree, 5 = completely agree)</p> <p>HRMTD1 We offer our employees opportunities to deepen and expand their expertise.</p> <p>HRMTD2 We offer training that provides employees with up-to-date knowledge.</p> <p>HRMTD3 Our employees have an opportunity to develop their competence through training tailored to their specific needs.</p> <p>HRMTD4 Competence development needs of employees are discussed with them regularly.</p>

Best practices	<p>To what extent do the following statements on learning practices apply to your company? (1 = completely disagree, 5 = completely agree)</p> <p>LRNMECH2 Our company systematically collects best practices and lessons learned.</p> <p>LRNMECH3 Our company makes systematic use of best practices and lessons learned.</p>
Socialization	<p>To what extent do the following statements on supervisory work apply to your company? (1 = completely disagree, 5 = completely agree)</p> <p>KMLEAD6 Supervisors share knowledge in an open and equal manner.</p> <p>To what extent do the following statements on learning practices apply to your company? (1 = completely disagree, 5 = completely agree)</p> <p>LRNMECH1 Our company transfers knowledge from experienced to inexperienced employees through mentoring, apprenticeship and job orientation, for example.</p> <p>To what extent do the following statements on human resources management apply to your company? (1 = completely disagree, 5 = completely agree)</p> <p>HRMREC2 When recruiting, we pay special attention to learning and development ability.</p>

In total 259 companies responded to the survey and the final response rate of the survey was 17%. In total 78.4% of the informants were directors for human resources. The rest of the informants were either managing directors, other directors or experts/clerical employees. Considering the industries involved in the survey, manufacturing was most represented with a share of 37.8%, as indicated by Figure 4. Wholesale and retail accounted for 16.2% of the companies, services for 9.7% and transportation and storage for 8.1%.

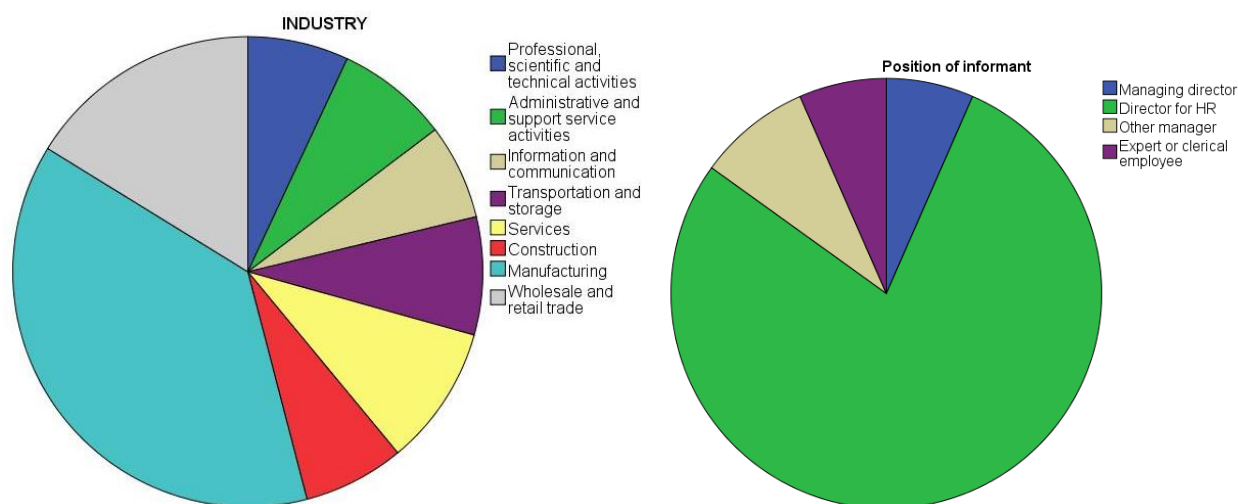


Figure 4. Distribution of the firms by industry and by the position of the informant within the company.

In total 57.1% of the companies were SMEs and the rest were large companies according to the definition of the European Commission (2003). Categorization could of course be done differently and indeed has been done by e.g. Inkinen et al. (2015), but the significance of the categorization for my statistical analyses is fairly low as the original data instead of the categorized data is used.

6.3 Statistical methods

Statistical analyses performed during this work were numerous. Correlation analysis was used to evaluate inter-connectedness of the independent and dependent variables, factor

analyses were done to construct sum scales, reliability of the measures was evaluated using Cronbach's alpha and finally the mediation effect between the variables was tested using both correlation analysis and regression based on development by Baron & Kenny (1986). The statistical testing procedure in total is presented in Figure 5.

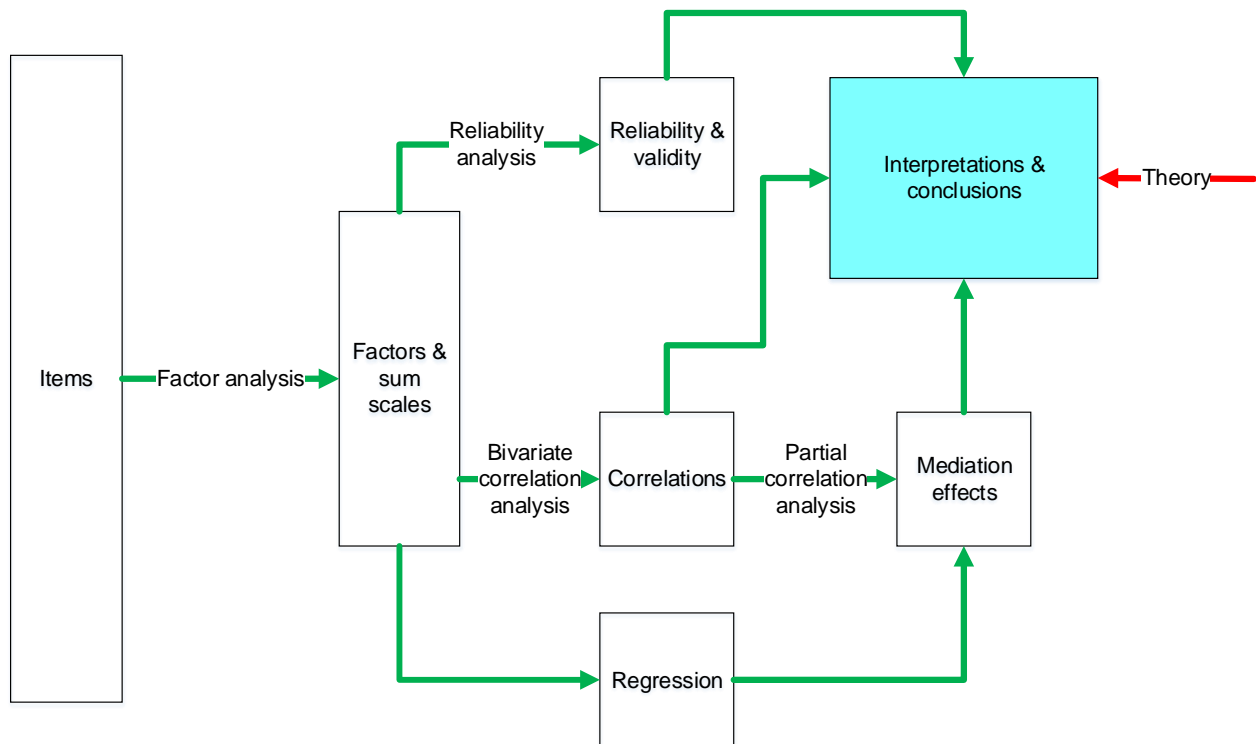


Figure 5. A simplified diagram of the statistical analyses done in this work.

Control variables included the age of the firm, the size of the firm, the share of staff involved in R&D in the firm and the industry of the firm. The number of employees was used as an approximation of the size of the firm. The age was calculated from the year of establishment until 2013. R&D share was reported by the informants during the data collection. To satisfy the requirement of normally distributed independent variables, the data was treated by using either a natural logarithm transformation (R&D) or a logarithm transformation (age and size of the firm). In total 8 industries were considered: (1) professional, scientific and technical activities, (2) administrative and support service activities, (3) information and communication, (4) transportation and storage, (5) services, (6) construction, (7) manufacturing and (8) wholesale. The data on the industry was coded

into eight dummy variables for regression purposes. Initial correlation indicated that the size of the firm would not depend on its industry. The age of the firm was found to have a statistically significant negative correlation with the industry of the firm being administrative and support services. Other correlations were not indicated. The share of staff was found to positively correlate with the company practicing professional, scientific and technical activities or manufacturing and to negatively correlate if the company was in transportation and storage or wholesale. These correlations were evaluated to verify that none of the control variables would be highly correlated with one another. All the correlations were below ± 0.3 .

6.3.1 Factor analyses

Factor analysis is a common method for treating large quantities of data. Factor analysis can be used to explore the underlying dimensions of a set of variables. Furthermore, factor analyses are used to reduce down data and to evaluate scales and form sum scales. Factor analyses take on various forms. What is commonly performed in research similar to mine is confirmatory factor analysis (CFA). However, CFA is not possible in SPSS. Exploratory factor analysis (EFA, also sometimes referred to as common factor analysis) can be performed in SPSS. Furthermore, a principal component analysis (PCA) can be performed in SPSS. There is a principal difference between PCA and EFA. In PCA the total variance explained is always assumed to be 1.00 whereas in EFA only the variance common to all the variables is being explained (Metsämuuronen, 2008). This means that the variance explained in EFA is most often below 1.00.

The desired **rotation** method depends on whether we wish to allow for correlation of the factors or not. If we wish to define that the factors are uncorrelated we will choose orthogonal rotation and consequently e.g. Varimax in SPSS. However, it is quite common that factors are not completely uncorrelated. In these cases one can choose oblique rotation, e.g. Direct Oblimin in SPSS. The problem with oblique rotation is that the interpretation of the factors is more complicated and also quite useless with one-factor solutions. (Metsämuuronen, 2005, p. 603)

The decision on how many factors to include can be based on both statistical and theoretical considerations. The **dimensions** of a concept are defined, or confirmed, by factor analysis. Thus, if assuming that a concept is unidimensional one factor should be the conclusion from factor analysis, too. Statistically this can be evaluated through the scree plot and the total extracted sums of squared loadings. Generally, values above 1 indicate factors of interest.

The method in this work for extracting the factors was principal axis factoring, which is a form of EFA, and Varimax was used as the rotation method. The number of factors was statistically evaluated using the scree plot. Factor loadings above 0.3 were considered sufficient. Furthermore, the overall appropriateness of the factor analysis was evaluated based on the Kaiser-Meyer-Olkin (KMO) measure and the Bartlett's test. KMO of 0.4 or above was considered acceptable. It is worth noting that different threshold values have been presented for KMO. Statistical significance formed the acceptability criterion in Bartlett's test. Communalities between the items were also used to evaluate the factor solution. Factor analysis was done on all the variables – both independent and dependent.

6.3.2 Reliability and validity

Reliability is according to Metsämuuronen (2005) a measure of the repeatability of the measurement. **Validity** in turn reflects whether the measure describes the concept under investigation.

Reliability is a measurement of consistency of the measures and is often estimated by using **Cronbach's alpha (α)**. Cronbach's alpha is the most popular measurement to determine the reliability of measures and it ranges from 0 to 1. However, the acceptable level of Cronbach's alpha is debatable. Commonly, a value equal or greater than 0.6 in exploratory research is considered acceptable (Metsämuuronen, 2005, 69). The number of items significantly affects the Cronbach's alpha and thus it is common to favor more

items rather than fewer. As the number of items increases so does the Cronbach's alpha even with fairly low inter-item correlations.

Evaluating validity is often fairly difficult to do after data collection. Systematic errors can be difficult to estimate and might not be even visible. Survey research can always be affected by untruthful responses. The responses can reflect the way the respondent thinks things should be rather than how they actually are leading to erroneous data. As the key informant technique was used in this study, it is important to acknowledge that only a single informant in even fairly large companies has been used to describe the state of the firm and thus it is very important that the informant is privileged to the information needed, would be as unbiased as possible and would understand the implications of his/her responses for the research. As this work only involves Finnish companies, cultural differences need not be accounted for.

6.3.3 Cluster analysis and comparing means

Cluster analysis is a way to identify grouping within the data. Grouping with respect to specific factors can provide additional insight into why differences occur between groups and can help interpret the results of statistical analyses.

I performed cluster analysis based on the control variables used in this work – age of the company, number of employees and R&D share of the company. Two-step clustering was done in SPSS evaluating the clustering of innovation performance and renewal capital.

I also analyzed all the variables with respect to importance of tacit and explicit knowledge and importance of tangible assets to gain further understanding of the values driving various knowledge management activities and of the indicators of performance. I performed one-way analysis of variance (ANOVA) to evaluate the statistical significance of the mean variance.

6.3.4 Correlation analysis

Correlation analysis is a fairly simple method for establishing a link between two variables. **Pearson correlation coefficients** are a commonly used measure of correlation. The coefficient varies between -1 and 1 with both of these indicating perfect correlation between the two variables. Negative values indicate negative correlation and positive values indicate positive correlation. As values move closer to 0 the correlation is weakened and the value 0 means that there is no linear correlation. It is important to keep in mind that the coefficient only describes linear relationships and cannot account for other types of mathematical expressions. Furthermore, outliers can significantly affect the coefficient. (Heikkilä, 2014, p. 192–193)

It is also advisable to test the significance of the correlation coefficient using a predefined **significance level** represented by the p value. The significance level varies but commonly used p values are 0.01 and 0.05. Interpreting p values depends on the hypothesis being tested. In testing the significance of correlation coefficients p values should be lower than the chosen significance level as the null hypothesis in testing correlation coefficients is that there is no linear dependency between the variables and that the correlation coefficient is explained by random chance. I am reporting significance levels of 0.01 and 0.05 in significance testing and am only referring to statistically significant when either of these criterion was fulfilled. For correlations I used a cut-off of 0.2 and am considering only correlations above that to be significant and worth investigating. (Heikkilä, 2014, p. 194–195)

It is important to keep in mind that in social sciences where data sets can be very large even low correlations can be statistically significant and worth investigating. In general a low enough p value is required for the correlation to be significant but despite a low p value the correlation can be low. Furthermore, correlation analysis can only describe if there is a dependency and how strong that dependency is between two variables. The nature of that dependency requires further analysis, e.g. regression analysis. Finally, correlation alone is not sufficient evidence to argue for causality.

A fairly common way of presenting the results of correlation analysis is a correlation matrix. I will be using this presentation as well. Another way of presenting correlations is to visualize them, i.e. plot the data and a trend line commonly calculated based on the partial least squares method.

6.3.5 Testing for mediation

To test whether mediation takes place I adopted the approach proposed by Baron & Kenny (1986) in terms of the conditions that need to be met for mediation to be established. The conditions are: (1) the independent variable has an effect on the dependent variable, (2) the independent variable has an effect on the mediator and (3) the mediator has an effect on the dependent variable (p. 1177). Baron & Kenny (1986) propose the use of regression for testing the mediation effect. However, testing the mediation model can also be done through partial correlation analysis. Partial correlation analysis is used to eliminate, or control, for the effect of a third variable when testing the correlation between two other variables (Heikkilä, 2014, p. 230; Metsämuuronen, 2005, p. 352).

Using partial correlation analysis the testing comprises four steps:

1. Testing for the direct relationship between the independent variable and the dependent variable (i.e. the unmediated model) to establish that there is a relationship to investigate.
2. Testing for the direct relationship between the independent variable and the mediator.
3. Testing for the relationship between the independent variable, the mediator, and the dependent variable with treating both the independent variable and the mediator as predictors. This is where the effect of the mediator on the dependent variable is investigated while controlling the independent variable.
4. Establishing whether the mediation is complete or partial is done as described in step 3. If the significance of the direct effect of the independent variable on the

dependent variable, i.e. path c of Figure 3, becomes low enough, the mediation is complete. If not, partial mediation is observed.

The size of the company (Fiol & Lyles, 1985), the age of the company, its share of employees involved in R&D and its industry (Fiol & Lyles, 1985) were chosen as control variables as previously described in Chapter 6.3. I used partial correlation in SPSS to control for the effect of the above mentioned variables while testing for the mediation model. Including the control variables and then in the 3rd step treating both the independent variable and the mediator as predictors requires a stepwise partial correlation analysis. I first have to control for the above mentioned control variables and their effect on my independent variables, mediator and dependent variable. Finally I can control the independent variable while testing for the effect of the mediator on the dependent variable.

6.3.6 Regression

It is quite common to perform regression analyses on quantitative data. In my case linear regression or multiple regression analysis would maybe be the most suitable technique for investigating the effect of the selected knowledge management practices on renewal capital and innovation performance. In many cases interaction terms, formed by the variables, are also included in the statistical model. Furthermore, whereas multiple regression, or multivariate regression analysis, might be a useful tool for evaluating the relationship of e.g. training expenditures and net sales the use of such a regression does not yield too meaningful results when evaluating the relationship between different items of survey data measured on a Likert scale. Managerial conclusions other than those already obtained from correlation analysis cannot be drawn from a regression equation or, to be exact, from regression coefficients.

Regression coefficients, commonly annotated as β_i , are used to evaluate the magnitude of effect of different variables. Associated p values are, as in the case of correlation coefficients, used to evaluate the statistical significance of the regression coefficients. The problem with regression coefficients in my case is that they hold no theoretical meaning.

A regression equation is a purely statistical interpretation of the relationship between the variables and analyzing the relationship, its causes or effects is impossible based on the equation. The applicability of a regression equation outside the range of the variables used to generate the equation is seriously questionable. This is well demonstrated when looking at the constant of the equation. It often deviates from zero but holds little meaning in terms of the phenomenon under investigation. An example is provided in Eq. (1)

$$Y=2.51+1.04x_1+0.68x_2 \quad (1)$$

where Y is the net sales of a firm and x_1 and x_2 are the number of employees and the number of customers, respectively. The equation would suggest that even if the firm had no employees and no customers the net sales would still be positive, which hardly seems plausible. The example is purely fictitious and is only used to demonstrate the challenges using regression analysis for meaningful interpretation of a phenomenon.

Regression analysis is commonly performed to study the mediation mechanism when needing to control for a number of variables. The same can, however, be achieved using partial correlation analysis in SPSS.

Despite this criticism towards the usability of regression analysis – regression coefficients for interpretation to be exact – I will use regression to test for mediation as well. I will do this because Baron & Kenny (1986) have argued that it would be necessary to evaluate the absolute sizes of the regression coefficients as interpretation of mere significance of the coefficients can be challenging due to multicollinearity.

I used linear regression in SPSS. Using Enter as the regression method in SPSS forces all the defined independent variables into the regression equation. Using a stepwise method testing for the statistical significance of the variables and either including or excluding them accordingly would also be possible. There is a difference in the statistics provided by SPSS for the regression models as Enter considers all the independent

variables and Stepwise only the statistically significant ones. Thus e.g. R and R^2 values tend to be higher for regression equations including all the independent variables.

7 RESULTS

The statistical procedure in detail and the consequent results of the analysis of data has been presented in this section.

All the data collected during the Intellectual Capital and Value Creation project was not needed to study the model I have proposed here. I chose to use the full set of items regarding innovation performance (INNOPER), renewal capital (RENCAP) and training and development (HRMTD). Furthermore, the full set of items on learning mechanisms was also used but divided to cover both best practices and socialization. The set on socialization included LRNMECH1 and was complemented with additional question on leadership (KMLEAD6) and recruiting (HRMREC2).

IBM SPSS Statistics was used to run the statistical analyses as referred to many times in the previous Chapter. The data was copied from Excel and inserted into the SPSS data table. Descriptive statistics were ran to check for errors in the input data. All input data was found to be within appropriate limits. Furthermore, normality of each of the variables was checked using the Shapiro-Wilk test. The histogram of the age of the company showed the most deviation from normality, but this effect results from selecting the age categories and could be manipulated by choosing different categories. As previously described, I did transformations on the control variables to satisfy the need for normality.

The basic company information contained a number of metrics which needed to be categorized for further analysis. These included the number of employees in the company and the age of the company. The number of employees was categorized into two according to the European Commission (2003): small and medium-sized enterprises with less than 250 employees and large enterprises with more than 250 employees. The age of the company was categorized into 11 categories starting from those less than ten years old with intervals of 10 years up to 100 years and finally those more than 100 years old.

7.1 Factor analyses and sum scales

As previously mentioned not all items need to be included in the final scales used for statistical analyses. It is common to perform factor analyses to investigate the scales and make decisions on items included in sum scales. Here sum scale refers to the variables being summed and a mean being calculated.

Loadings of a one factor solution of each of the variables is presented in Table 2. A one factor solution provided a satisfactory solution in all the cases. The explained cumulative variance for innovation performance and socialization was not too high.

As can be seen from Table 3 when performing factor analysis on all the variables and items together and considering five factors (assuming unidimensionality of all five concepts in the model) the items in most cases loaded strongly on different factors. The problem arose with the concept developed here, socialization, where the highest loadings of KMLEAD6, HRMREC2 and LRNMECH1 were observed on factors 2, 1 and 2, respectively. Including only LRNMECH1 to socialization, i.e. forming a one-item concept, resulted in LRNMECH1 grouping together with LRNMECH2 and LRNMECH3 but with a significantly lower loading than the others – 0.487, 0.820 and 0.844, respectively.

Table 2 Factor loadings of a one factor solutions for each of the variables. The extraction method used was principal axis factoring and the rotation method was Varimax.

Item	Factor 1	Cumulative variance explained, %	KMO	Bartlett
INNOOPER1	0.583	35.071	0.741	Pass
INNOOPER2	0.587			
INNOOPER3	0.629			
INNOOPER4	0.420			
INNOOPER5	0.705			
RENCAP1	0.634	50.268	0.744	Pass
RENCAP2	0.700			
RENCAP3	0.786			
RENCAP4	0.707			
HRMTD1	0.811	58.691	0.786	Pass
HRMTD2	0.809			
HRMTD3	0.779			
HRMTD4	0.655			
LRNMECH2	0.888	78.816	0.500	Pass
LRNMECH3	0.888			
KMLEAD6	0.481	33.729	0.624	Pass
LRNMECH1	0.689			
HRMREC2	0.554			

Multicollinearity exists when two or more of the independent variables, or predictors, are significantly correlated to one another. As regression coefficients are not the primary interest in this work, while a comprehensive statistical regression model offers little value to my hypotheses, multicollinearity could be seen as a merely small problem. However, as I am reporting regression coefficients here it is important to consider multicollinearity.

To avoid problems with multicollinearity the variance inflation factors (VIF) were checked for training and development, best practices and socialization after the sum scales were formed using the collinearity diagnostics in SPSS as recommended by Metsämuuronen (2005, p. 672). All values were below 1.5 indicating multicollinearity should not be a problem with the regression analysis. Furthermore, simple correlations between the selected items and the sum scales indicated a correlation high enough to proceed with the sum scales.

The factor analysis resulted in eliminating one item from innovation performance (INNOPER4). INNOPER4 showed significantly lower correlations with the other items and loaded strongly on the second factor in a two factor solution whereas the loadings of the other items were high on the first factor. The extracted variance with the one component solution was only 0.299. KMO was 0.741 and Bartlett's test showed statistical significance. Renewal capital, training and development, best practices and socialization were left as they were originally.

The factor solution for socialization was not a success as can be seen from Table 3. Loadings were not observed on an individual factor but were observed on other factors representing other concepts. The combination of KMLEAD6, HRMREC2 and LRNMECH1 was not as successful as I would have hoped but I continued with the construct. Problems were foreseen as the scale is not based on previous research, has not been tested and is not developed for this purpose. It is merely a combination of items of other scales.

Table 3 Factor loadings for all the used items in a five factor solution. Items in parentheses indicate loadings below the acceptable level. The extraction method used was principal axis factoring and the rotation method was Varimax.

Variable	Factor*				
	1	2	3	4	5
HRMTD2	0.753				
HRMTD3	0.709				
HRMTD1	0.685				
HRMTD4	0.611				
KMLEAD6	(0.225)	0.361	(0.250)	(0.095)	(0.100)
HRMREC2	0.349	0.306	(0.232)	(-0.099)	(0.113)
LRNMECH1	0.323	0.531	(0.149)	(-0.090)	(0.064)
LRNMECH3		0.832			
LRNMECH2		0.811			
RENCAP3			0.626		
RENCAP2			0.596		
RENCAP1			0.589		
RENCAP4			0.588		
INNOPER5				0.719	
INNOPER3				0.579	
INNOPER1				0.459	
INNOPER4				0.447	
INNOPER2				0.331	

* Factor representation was assumed to be as follows: 1 = Training & development, 2 = Best practices, 3 = Renewal capital, 4 = Innovation performance, 5 = Socialization

The final factor solution is presented in Table 4. As can be seen this factor solution is also not without problems in terms of the socialization construct I am using in my work. Whereas including all the INNOPER items led to a solution where the items of socialization at least loaded primarily on two factors, 1 and 2, now the loadings are divided among three factors, 1, 2 and 5.

Table 4 Final factor solution.

Variable	Factor*				
	1	2	3	4	5
HRMTD3	0.751				
HRMTD2	0.721				
HRMTD1	0.705				
HRMTD4	0.620				
HRMREC2	0.370	(0.248)	(-0.042)	(0.219)	(0.104)
KMLEAD6	(0.224)	(0.272)	(0.127)	(0.188)	0.476
LRNMECH1	0.365	0.399	(-0.065)	(0.117)	(0.102)
LRNMECH3		0.842			
LRNMECH2		0.812			
INNOPER5			0.641		
INNOPER3			0.640		
INNOPER2			0.577		
INNOPER1			0.577		
RENCAP4				0.638	
RENCAP3				0.598	
RENCAP2				0.560	
RENCAP1				0.558	

* Factor representation was assumed to be as follows: 1 = Training & development, 2 = Best practices, 3 = Renewal capital, 4 = Innovation performance, 5 = Socialization

Once the factor analysis was done and the sum factors formulated to reduce the data down to a manageable number of variables I went through the whole data set to eliminate those sum scales where data was missing from the appropriate questions. This treatment resulted in 196–211 cases to be used in testing of the mediation model depending on the control variables used. The treatment was especially important for the socialization and best practices factors as both of these consisted of only two variables and missing values might thus significantly influence the sum factors and result in erroneous outcomes.

To ensure multicollinearity would not be a problem I ran collinearity diagnostics as recommended by Metsämuuronen (2005, p. 672) using linear regression in SPSS. All

independent variables were included in the analysis. All the variance inflation factors (VIF) were below 3, which can be considered an acceptable limit for detecting multicollinearity issues. Thus, multicollinearity should not present a problem in the analysis.

7.2 Reliability and validity

The reliability of the measures was evaluated using Cronbach's alpha as described in chapter 6.3.2. The values for Cronbach's alpha for the original scales and those originating from the factor analyses have been presented in Table 5.

Table 5 Cronbach's alpha for each of the measures when using the original number of items and using the sum scale for calculations.

Measure	N items originally	α	N items in sum scale	α
Innovation performance	5	0.717	4	0.718
Renewal capital	4	0.796	4	0.796
Training & development	4	0.840	4	0.840
Best practices	2	0.881	2	0.881
Socialization	3	0.591	3	0.591

With omitting one item from the scale on renewal capital the Cronbach's alpha went down slightly. This is not a desirable effect but the decrease was fairly small and the alpha value was still well above the accepted level.

It is worth noticing that all Cronbach's alpha are above the acceptable limit of 0.6 except that for socialization. As the alpha is below the acceptable level, the results should be interpreted very cautiously. The consistency problem most likely arises from the manipulation of the scales that I have done. The originally generated scales have solid theoretical foundations whereas the combination I have done lacks that. Another possibility would be to use only one item to describe socialization. Indeed, single item scales have been used by researchers, especially in psychology, and have been

advocated to be appropriate in some cases. However, those cases commonly embody highly unambiguous concepts consisting of a low number of dimensions.

7.3 Cluster analysis and comparing means

Cluster analysis of innovation performance showed that the age of the company, the number of staff and the share of staff involved in R&D seem to be linked – more established companies have a higher number of employees and invest more in R&D. However, this did not seem to show in innovation performance as the means of innovation performance for these younger and older companies were 3.30 and 3.38. The same result was observed when looking at renewal capital.

When looking at the importance of tacit and explicit knowledge I found that on average the respondents considered tacit knowledge (mean 3.81) more important than explicit knowledge (mean 3.29). However, when clustering innovation performance based on the importance of tacit knowledge no significant difference was found between those considering tacit knowledge more important (scoring 4-5) and those considering it less important (scoring 1-3). When doing the same with respect to importance of explicit knowledge the difference in means was more profound. The same cluster analysis was done for renewal capital. There both the importance of tacit and explicit knowledge resulted in significant differences in means. The means for the clusters can be seen in Figure 6.

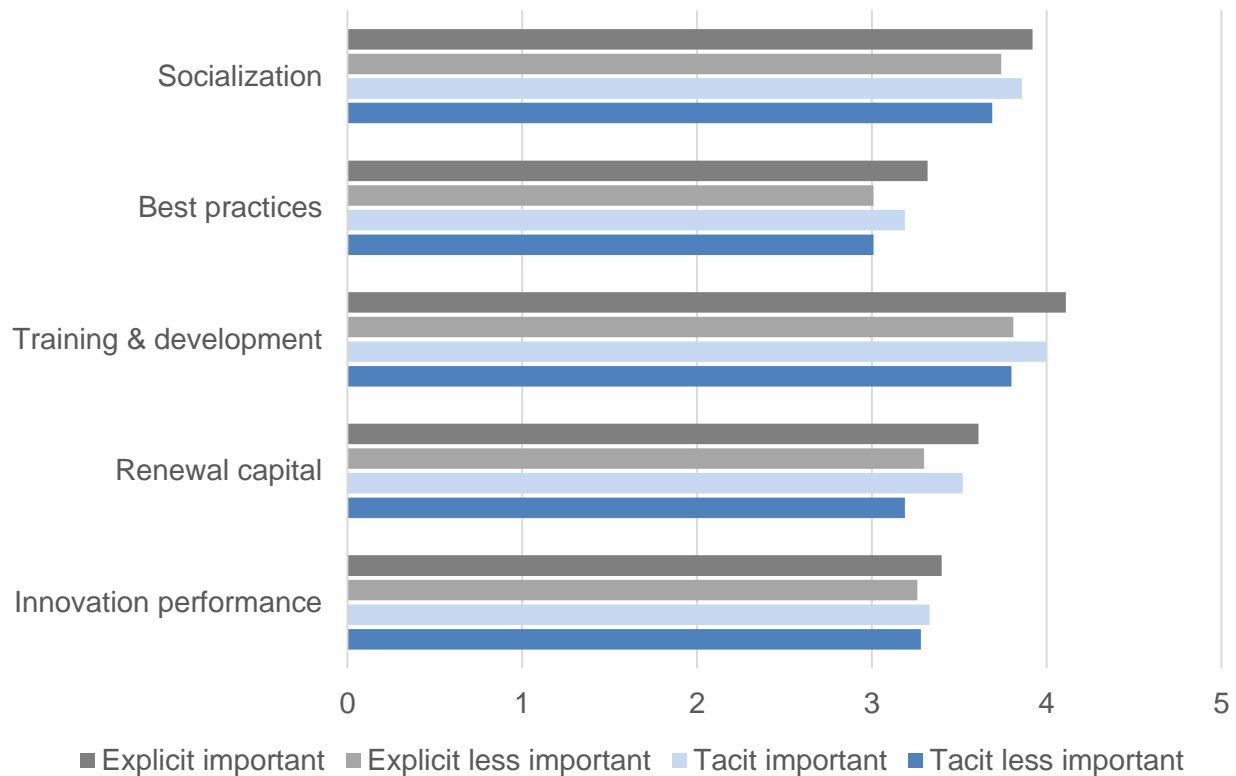


Figure 6. Means for all the studied variables with respect to importance of tacit and explicit knowledge. Less important and important mean scores of 1-3 and 4-5, respectively.

It would seem that where knowledge in general is considered important training and development is provided more. However, even firms where knowledge is considered less important (scoring 1-3) training is still on average relatively extensive. This finding could go to show that training is in general considered important.

ANOVA showed that not all the variation in the means between the groups was significant. Only renewal capital showed statistically significant ($p < 0.05$) variation in the means between the groups when testing with respect to both tacit and explicit knowledge. Explicit knowledge yielded statistically significant differences in all the predictors and tacit knowledge only in training and development. Innovation performance was unaffected by both the importance of tacit and explicit knowledge. Standard deviations between the

groups were in all cases close to each other indicating that the use of ANOVA is appropriate.

ANOVA showed that no statistically significant difference between groups existed when comparing the means of the variables with respect to age of the company, number of employees and R&D share. Although statistical significance was not found between the groups the finding is not a reason to reject these variables as control variables as they may influence the relationships between the different variables when testing for mediation.

7.4 Correlations between the constructs

To finally evaluate the links between the constructs and prove the applicability of the mediation model I performed correlation analyses in three stages. The results of each of those stages are presented in the following three chapters. Correlations between the variables has been shown in Table 6.

Table 6 The partial correlation matrix when controlling for the size of the company, the age of the company, the share of its employees involved in R&D and its industry.

Variable	Mean	SD	1	2	3	4
1. Innovation performance	3.32	0.56				
2. Renewal capital	3.39	0.61	0.418**			
3. Training & development	3.89	0.72	0.241**	0.520**		
4. Best practices	3.06	0.83	0.197**	0.417**	0.407**	
5. Socialization	3.79	0.59	0.135	0.412**	0.491**	0.527**

** Correlation is significant at the 0.01 level (two-tailed)

7.4.1 Linking training and development, best practices and socialization to renewal and innovation performance

As could be seen from Table 6 all independent variables – training and development, best practices and socialization – were positively and statistically significantly correlated with renewal capital in firms. Correlation of socialization with renewal capital was found lower than training and development and best practices.

Table 7 Pearson's correlation coefficients for the different relationships in the studied model when controlling for the size of the company, the age of the company, the share of its employees involved in R&D and its industry.

Relationship	Pearson's correlation
Training & development – Renewal capital	0.520**
Best practices – Renewal capital	0.417**
Socialization – Renewal capital	0.412**
Training & development – Innovation performance	0.241**
Best practices – Innovation performance	0.197**
Socialization – Innovation performance	0.135

** Correlation is significant at the 0.01 level (two-tailed)

A negative correlation between best practices and renewal was not found in correlation analysis. Also, a negative correlation between socialization and renewal was not found.

The problem here is that I have chosen 0.2 as a threshold for evaluating correlations and the correlation between innovation performance and best practices and innovation performance and socialization does not exceed that threshold. Nevertheless, this threshold is arbitrary and could be set lower or higher resulting in different interpretation of the results. The acceptable limit for the correlation coefficient depends on a number of things amongst other the size of the data set. A more serious problem is the lack of a statistically significant correlation between socialization and innovation performance. The

p value for the coefficient was 0.08 and does not fall even within the limit of a 0.05 confidence interval.

7.4.2 Proving that renewal mediates the relationship between innovation and knowledge management practices

The correlation analysis in chapter 7.4 showed that a direct relationship between innovation performance and the independent variables – training and development, best practices and socialization – for most parts exists and is statistically significant. This is the first step in confirming that mediation is a possible mechanism. The objective is to show that a relationship which can be mediated exists between the independent variables and the dependent variable.

The second step is to show that the independent variables are correlated with the mediator. These correlations were also shown to exist in the correlation analysis in chapter 7.4. The second precondition for mediation was thus confirmed.

Finally, the last step proving mediation as a plausible mechanism between the dependent variable and the independent variables is the investigation of the correlations between the independent variables, the mediator and the dependent variable. Figure 7 shows the correlations between the dependent variable (innovation performance), the mediator (renewal capital) and the independent variables (training and development, best practices and socialization). The direct effects of the independent variables on innovation performance and renewal capital were presented in Table 7. The mediation effect was evaluated and is shown in Figure 7 as the correlation between renewal capital and innovation performance. The p values for the correlation between the independent variables and innovation performance when the mediation was controlled were: 0.677 for training and development, 0.523 for best practices and 0.679 for socialization. The p values were high enough to suggest complete mediation.

It is, however, important to notice, that the correlations between best practices and innovation performance (0.197) and socialization and innovation performance (0.135) were very low when testing for the mediation model. In fact, they were so low that considering a threshold value of 0.2 the correlation would not reach a satisfactory level for meriting interpretation. However, this finding needs to be interpreted fairly cautiously as threshold values for correlations are arbitrary.

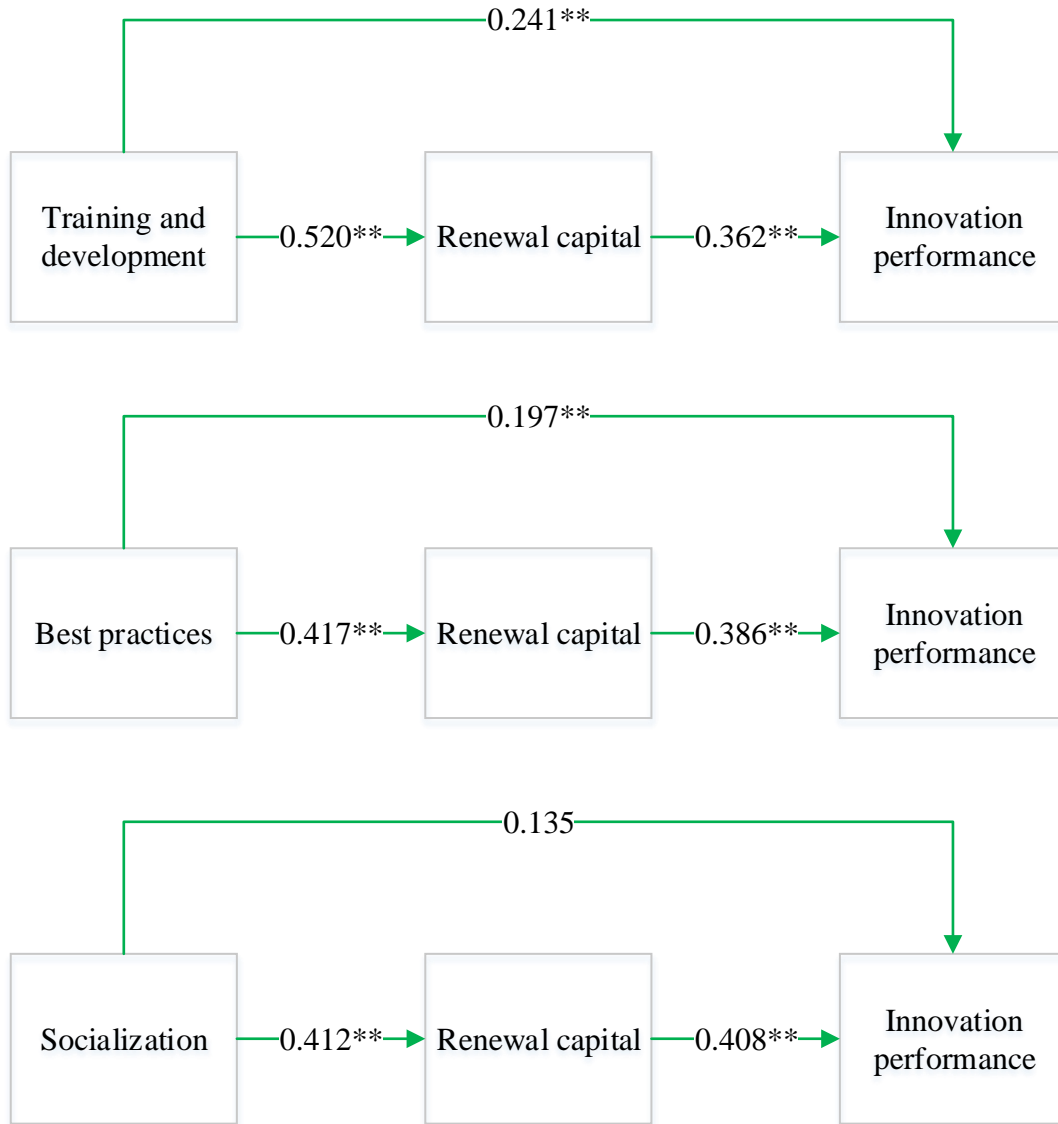


Figure 7. Direct correlations between the independent variables and the dependent variable (path c of Figure 3) mediator and the independent variables and the dependent variables (path a) and the mediation correlations (path b). The direct correlations between the independent and dependent variables do not represent the correlations when mediation is controlled. **Correlation is significant at the 0.01 level (two-tailed) respectively.

The most significant problem arose with the relationship between socialization and innovation performance showing a p value too high to be statistically significant (p value

of 0.061) indicating that there would be now real relationship between the independent and the dependent variable.

I decided to test the regression approach recommended by Baron & Kenny (1986) too to evaluate the suitability of my mediation assumption. The regression results are shown in Table 8. Steps 3 and 4 are combined in the investigation of the effect of the mediator on the dependent variable while including the independent variables in the regression equation.

The p values of the independent variables when mediation is controlled become high enough to deem them statistically insignificant while the p value of the mediator, renewal capital, is high enough to be statistically significant. As with partial correlation analysis, complete mediation is supported. There are some differences in the correlations and in the p values between the correlation analysis and the regression but they are fairly small.

As was for partial correlation analysis the relationship between socialization and innovation performance was found statistically insignificant.

In regressing the independent variables with renewal capital I found one of the industry classifications statistically significant: professional, scientific and technical activities. The B and β coefficients were positive and without exceptions the variable was found statistically significant on a 0.01 level confidence interval. This might mean that renewal capital is positively associated with this specific industry when the evaluated KM practices are employed.

The standardized regression coefficients suggest that increase in training and development would result in the highest direct increase in innovation performance whereas socialization would result in the lowest direct increase. However, according to the regression coefficients, mediation through renewal capital is the highest for socialization.

Table 8 Unstandardized B coefficients, standardized β coefficients, p values and VIF for the four steps of regression to test for mediation. The size of the company, age of the company, its share of employees involved in R&D and its industry were included in the regression.

1. Independent variable to dependent variable (innovation performance)					
	B	Standardized β_i	Correlation	p value	VIF
Training & development	0.181	0.234	0.228	0.001	1.062
Best practices	0.134	0.199	0.193	0.006	1.061
Socialization	0.124	0.132	0.126	0.076	1.097
2. Independent variable to mediator (renewal capital)					
Training & development	0.439	0.509	0.486	0.000	1.095
Best practices	0.307	0.411	0.401	0.000	1.051
Socialization	0.432	0.404	0.386	0.000	1.095
3. / 4. Training & development and renewal capital on innovation performance					
Training & development	0.020	0.026	0.022	0.737	1.416
Renewal capital	0.386	0.424	0.351	0.000	1.455
3. / 4. Best practices and renewal capital on innovation performance					
Best practices	0.030	0.044	0.040	0.537	1.233
Renewal capital	0.383	0.420	0.373	0.000	1.270
3. / 4. Socialization and renewal capital on innovation performance					
Socialization	-0.032	-0.034	-0.030	0.638	1.269
Renewal capital	0.409	0.449	0.400	0.000	1.263

8 DISCUSSION

This section discusses the results presented in the previous section in light of their contribution to theory and practice of knowledge management. At the end I will also identify some limitations with respect to interpreting the results and applying the findings.

As the number of participating firms was quite high and many industries were represented in the data set the generalizability of the results is quite good in comparison to individual case studies.

It is important at this stage to recall the research questions guiding this work as they will be used to structure the discussion:

- Q1. How do individual and organizational (=collectivistic) learning processes differ?
- Q2. Which is more important for innovation performance: individual or collectivistic learning?
- Q3. What is the relationship between individual and collectivistic learning processes and renewal?
- Q4. Are individual and collectivistic learning processes related to innovation performance?
- Q5. What is the role of renewal in creating innovation performance?

8.1 Theoretical contributions

Mediation of the relationship between knowledge management practices and innovation performance by renewal capital was shown to be a plausible mechanism. Complete mediation was observed with all the independent variables.

The direct correlations between the predictors and the outcome became statistically insignificant but the correlations between renewal capital and innovation performance and renewal capital and most of the predictors were either satisfactory or even relatively high.

This provides support for the theory I have presented in my work: renewal would seem to be an essential part of how innovation performance is generated from knowledge management.

The analyses do not, however, entirely support the theory I have presented. A negative correlation was not found between best practices and innovation performance – instead the correlation was positive. The direct correlation on innovation performance was significantly lower than the mediation through renewal capital. For the purpose of the analyses I set a limit of 0.2 for the correlation between variables. The direct correlation between best practices and innovation performance did not exceed that limit and thus should be deemed negligible. Nevertheless, the relationship was found statistically significant and interpretation based on the set threshold limit for correlation should be used cautiously.. I argued based on my theory that collecting and employing best practices represents lower level learning and as such does not contribute to changing cognitive patterns and should thus not directly increase innovation performance either. However, the collection and employment of best practices can be an indication of an organization's affinity for learning. The more well developed these knowledge management practices are the more likely it is that an organization is keen on learning in other ways too. Based on my results it would seem that collecting and employing best practices is positively linked to renewal capital meaning that H2 is rejected.

The effect of socialization on innovation performance could be found to be completely mediated by renewal capital but arguing for the effect is difficult as a direct effect between innovation performance and socialization was not found. Possible mediation might indicate that when new members enter organizations they do not individually provide a boost in innovation performance. Rather, their entry inspires renewal in the organization. This renewal might be a result of new knowledge or new ways of operating. The correlation between socialization and innovation performance was found positive but statistically insignificant resulting in rejection of H1. The argument from Rebernik & Karin (2007) that socialization can hinder innovation is not supported by the results of my work but it is important to remember that my development does not reflect all the dimensions

of socialization but only those which might be expected to result in positive outcomes: transfer of knowledge, open communication and appreciation of affinity for learning in recruitment. According to Cooper-Thomas & Anderson (2006) socialization can promote a negative effect on innovation capabilities through over-socialization. This argument is not supported by the analysis I have done but it is important to keep in mind that I am arguing that socialization merely promotes the psychological link between an employee and the working community. To evaluate the effect of over-socialization on innovation performance would require longitudinal research and the evaluation of changes in cognitive patterns during the early stages of socialization and throughout an employee's career in a specific organization.

Training and development were found to correlate very strongly with renewal capital – even more so than best practices or socialization although both of these were built on assumptions of learning. H3 was thus confirmed. Investing in training and development would seem to positively affect innovation performance both directly and indirectly through renewal capital supporting H6. Furthermore, with the results presented here I am providing the evidence sought by Tharenou et al. (2007) on the importance of training on organizational outcomes. Whether the effect of training and development on innovation performance is due to increased knowledge and more refined skills or to promoting a culture of continuous improvement – or even both – is still left unexplained here.

It is quite interesting that renewal capital is the mediator as capital is often considered a static resource and requires action to be leveraged into value. Of course it is possible that the relationship between the mediator and the outcome is further moderated by another variables, e.g. a specific knowledge management practice, but that is impossible to determine based on this work.

One of my core ideas in this work was that knowledge management practices targeted at learning on individual level would result in more profound effect on innovation performance and thus socialization and training and development would have correlated more strongly with innovation performance. This idea was not fully supported by the

empirical work. Training and development did seem to have the strongest correlation with innovation performance but collecting and employing best practices and socialization yielded similar results.

To summarize shortly based on the research questions: There was little difference between the mediation of socialization and best practices by renewal capital – at least in terms of correlation analysis. With this it is difficult to say which is more important for innovation performance: promoting individual or collectivistic learning through KM practices (Q2). Only best practices were found to have a direct relationship to innovation performance whereas the direct relationship between socialization and innovation performance was left unconfirmed (Q4). In terms of the relationship between individual and collectivistic learning processes and renewal (Q3) and renewal and innovation performance (Q5) I can safely say that renewal mediates the effect of both individual and collectivistic learning on innovation performance.

8.2 Practical implications

The findings here have a number of practical implications possibly useful for managers within firms.

Often the actual measurable implications of training and professional development are difficult to show. My results show that training and development have significant effects on renewal, which is a precondition for innovation performance. It is worth noting that on average firms seem to invest in training and development more than they do in collecting and employing best practices or in socialization as many informants indicated that they provide opportunities for training within their organizations. This most likely reflects the fundamental assumption that training results in increased individual knowledge and skills and thus promotes performance. When looking at the correlations investing in training and development would seem like the most effective way of promoting innovation performance. The fundamental assumption thus is not erroneous.

Instead of a focus on creating more innovations managers might do well to focus on practices resulting in renewal through learning as it seems KM practices do not necessarily directly lead to innovations. A climate of learning and continuous improvement promotes higher-level learning and consequently results in changing cognitive patterns and complete new ways of thinking. As innovation performance is a complicated concept affected by many things it can be difficult to build practices directly affecting innovation performance. Instead, when understanding the interconnections between innovation performance and some intermediate outcomes of knowledge management practices it may be easier to build practices that affect those intermediary outcomes. It does not necessarily have to be so that only the innovation process itself is managed but we could consider managing the different functions within firms aligning many of them to contribute to innovation performance.

Considering that organizational management is a process penetrating through all the structures of a firm and that most managers within a firm are actors of organizational management whereas managing an innovation process is an art of few the impact of gearing organizational management towards enhancing innovation performance can be extraordinary. After all, the number of general managers versus innovation managers is high.

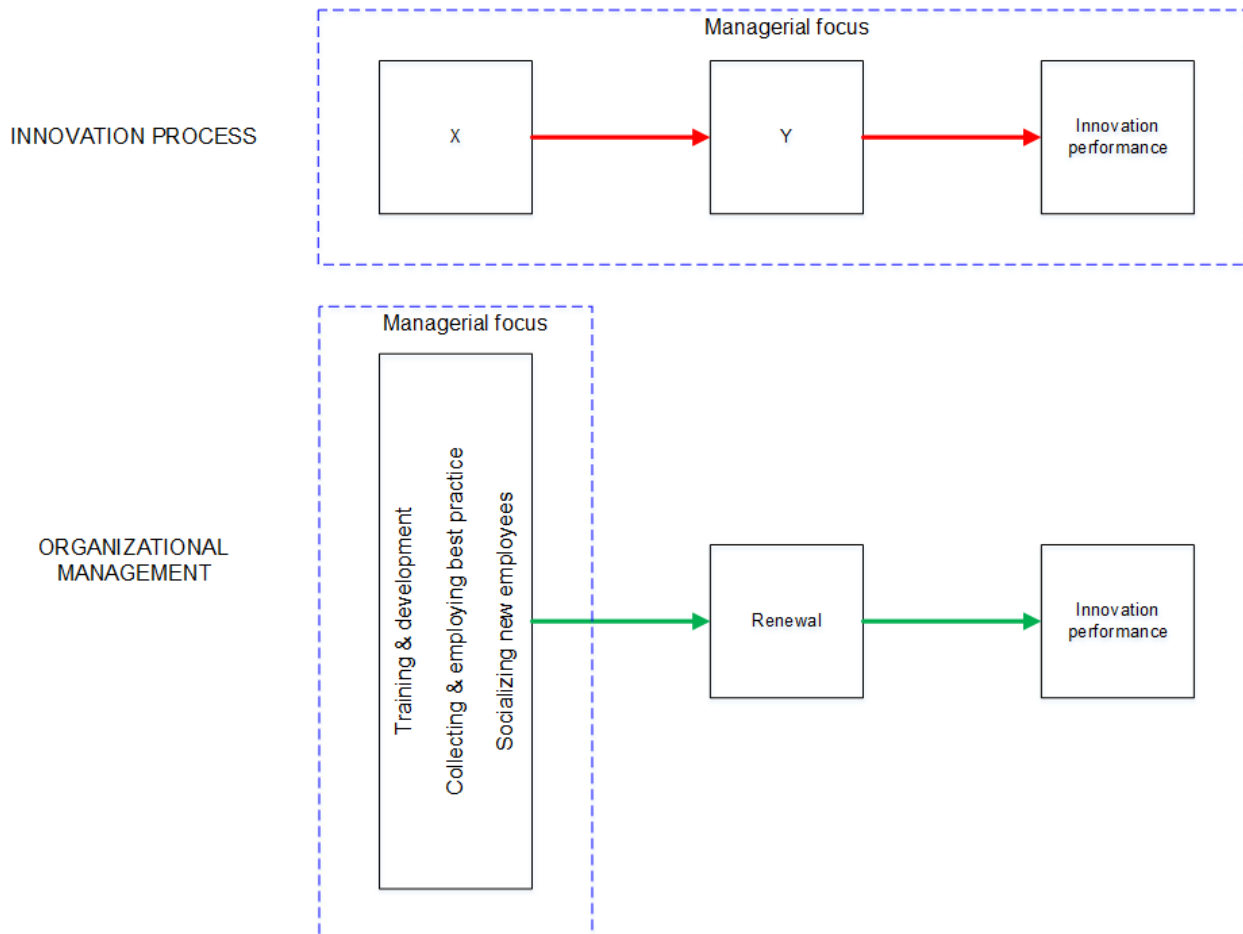


Figure 8. Shifting the managerial focus from merely managing an innovation process to produce innovation performance to managing organizational knowledge management processes to contribute to innovation performance.

Renewal capital does not appear from thin air. Managers should systematically drive renewal within organizations by various means. Seeking for new knowledge by recruiting new employees with well-developed learning abilities, transferring knowledge to those employees so that combining can take place, promoting learning by communicating that observing and applying best practices can be beneficial and encouraging supervisors to share knowledge openly are all activities geared towards learning and consequently renewal.

Whether or not a firm should invest in collecting and employing best practices is debatable. Although my empirical results propose that best practices are correlated with innovation performance it is difficult to evaluate if another knowledge management practice promoting organizational learning would yield just as good results.

8.3 Limitations and future research

As this study has not been conducted using longitudinal data it only represents one point in time and does not reflect the dynamic and changing nature of intellectual capital. Furthermore, the effect of various knowledge management practices might be reflected in changes in intellectual capital later on instead of intellectual capital and knowledge management practices correlating significantly in this one point in time. If knowledge management practices were already stable and a result of long-term development might intellectual capital at the same point in time reflect the relationship between the practices and the capital.

It is important to keep in mind that the questionnaire by which the data was collected was not specifically designed based on the hypotheses presented here. In my approach, I have separated the learning mechanisms into two phenomena instead of treating them as one. Furthermore, to obtain more than one item to describe socialization I combined items on leadership, learning and recruitment. This manipulation of the measures partially dismisses the pretesting of the questionnaire leading to a major drawback in validating the measures. Furthermore, this combination of items is not based on any previous investigations or validation made by other researchers. It would be very important to develop a scale reflecting socialization – specifically the aspect of learning through socialization. Socialization is a fairly multifaceted phenomenon and in my opinion includes dimensions positively affecting innovation performance and those negatively affecting it.

As my work is purely a quantitative study I had little possibilities to validate my model with interviews with professionals. Although validation through previous research provides a starting point the work could have significantly benefited from taking the developed model

and discussing it at least with some of the informants from the firms. They could provide further insight into what are the most significant effects of training and development and what does the collection and employment of best practices really reflect.

Some interesting questions still remain after showing that renewal capital is an important mediator between knowledge management practices and innovation performance. These questions include

1. Does training and development positively influence knowledge and skills of employees through fundamental higher-level learning thus resulting in renewal and increase in innovation performance or does it build a culture of continuous improvement which naturally enables renewal?
2. Is the positive correlation between best practices and renewal capital due to collection and employment of best practices being a knowledge management practice promoting renewal or is collecting and employing best practices merely an indicator of a learning-oriented culture? Furthermore, could any other lower-level learning practice be used instead of best practices as the predictor?
3. Would there be better scales for socialization so that we could really investigate the nature of the correlation? Now I did not reveal the negative correlation I was aiming for but I believe that the scale I used was not really appropriate for what I wanted to investigate.
4. Finally, although the link between knowledge management and innovation performance is highly interesting the model should also consider financial performance. Is innovation performance directly connected to financial performance and are there mechanisms by which KM practices directly influence financial performance?

The first two question could be further investigated by in-depth interviews and the third by a detailed literature survey focusing on finding appropriate items to measure socialization. Socialization as a phenomenon is quite an intriguing one as innovation is believed to originate from combination of knowledge and insight from various fields and expertise and

across value chains. On the other hand, socialization is an important process in integrating new talent into an organization but also in utilizing new knowledge within an organization.

To look into the last open question would require the expansion of the proposed model to include financial performance. Furthermore, other indicators such as customer satisfaction and even company reputation could be used to measure success in addition to financial performance.

9 CONCLUSIONS

In this work I have studied the connections between knowledge management practices promoting learning, renewal capital and innovation performance by drawing from extant literature to propose knowledge management practices to be mediated by renewal capital to result in innovation performance. Data was collected as part of the Intellectual Capital and Value Creation project in 2013. In total 259 Finnish companies responded to the survey.

The data was analyzed statistically using IBM SPSS. I did factor analysis, evaluated the reliability of the sum scales and did correlation analysis to test my mediation hypotheses. The mediation model was partially supported with two out of three predictors being mediated by renewal capital. Out of the 6 hypotheses I initially proposed 5 were supported by the analysis. Only the negative relationship between collecting and employing best practices and innovation performance was not supported by the data. Mediation of the relationship between KM practices and innovation performance was found in all cases: two relationships were mediated completely and one was mediated partially.

I have confirmed the finding of several other authors that knowledge management practices indeed affect innovation performance positively. However, the mechanism by which this effect takes place is still under discussion between academics and I have proposed a possible mechanism contributing to that discussion.

I propose that the effect of a number of knowledge management practices on innovation performance is mediated by renewal capital. Training and development, collecting and employing best practices and socializing new employees affect innovation performance through renewal capital.

As far as I know a model like the one I have presented has not been presented by other authors previously. Many have linked intellectual capital and knowledge management practices with innovation performance and thus the general concept holds little novelty.

However, arguing that renewal is essential in mediating the relationship between knowledge management practices and innovation performance provides new understanding on the crucial role of renewal capital in firm performance. Renewal capital as such is a fairly new concept although it can be to some extent equated to learning. Renewal and learning draw from a similar foundation: change. It is no wonder that in a rapidly changing environment we respond with foresight, learning, renewal and other similar concepts in attempt to anticipate changes and even benefit from them. Furthermore, if an organization can develop higher-level learning skills it can bring about competitive advantage based on an inimitable resource – a highly evolved culture expressed in a complicated learning process.

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APPENDIXES

Appendix 1 The original survey questionnaire used in the Tekes funded Intellectual Capital and Value Creation project.

BASIC COMPANY INFORMATION

JOBTITLE **Your position at the company:**

- 1 = Managing director
- 2 = Manager or director responsible for human resources administration
- 3 = Other manager or director
- 4 = Expert or clerical employee
- 5 = Other, please specify: _____

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)

		1	2	3	4	5
MARKPER1	Net sales growth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MARKPER2	Profitability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MARKPER3	Market share	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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)

		1	2	3	4	5
INNOPER1	Products and services for customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INNOPER2	Production methods and processes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INNOPER3	Management practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INNOPER4	Marketing practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INNOPER5	Business models	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Compared to other companies in its sector, how has your company succeeded in creating customer value over the past year? (1 = very poorly, 5 = very well)

		1	2	3	4	5
CUSTVAL1	Solving actual customer needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CUSTVAL2	Producing benefits related to perceptions and emotions for customers in addition to solving actual customer needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CUSTVAL3	Customer trust in your company's products, services and operations in general	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CUSTVAL4	Responsiveness to enquiries and problems as experienced by customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CUSTVAL5	Employees' professionalism and businesslike conduct as experienced by customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CUSTVAL6	Care and individual attention as experienced by customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CUSTVAL7	Value related to the display, tidiness and functionality of the company's products and services as experienced by customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Evaluate the effect of your innovation operations on your company's net sales over the past year (1 = no effect, 5 = significant positive effect)

		1	2	3	4	5
INNORAD	Entirely new products or services (radical innovation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INNOINK	Improved products or services (incremental innovation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

		1	2	3	4	5
JOBSAT1	Our employees are generally very satisfied with their jobs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JOBSAT2	Most of our employees would like to switch to another company. (R)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
JOBSAT3	Our employees are generally very satisfied with their current duties.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

INTELLECTUAL CAPITAL

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

		1	2	3	4	5
INTREL1	Different units and functions within our company – such as R&D, marketing and production – understand each other well.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INTREL2	Our employees frequently collaborate to solve problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INTREL3	Internal cooperation in our company runs smoothly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

		1	2	3	4	5
EXTREL1	Our company and its external stakeholders – such as customers, suppliers and partners – understand each other well.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EXTREL2	Our company and its external stakeholders frequently collaborate to solve problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EXTREL3	Cooperation between our company and its external stakeholders runs smoothly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

		1	2	3	4	5
STRUCAP1	Our company has efficient and relevant information systems to support business operations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STRUCAP2	Our company has tools and facilities to support cooperation between employees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STRUCAP3	Our company has a great deal of useful knowledge in documents and databases.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STRUCAP4	Existing documents and solutions are easily accessible.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

		1	2	3	4	5
HUMCAP1	Our employees are highly skilled at their jobs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUMCAP2	Our employees are highly motivated in their work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUMCAP3	Our employees have a high level of expertise.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

		1	2	3	4	5
RENCAP1	Our company has acquired a great deal of new and important knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RENCAP2	Our employees have acquired a great deal of important skills and abilities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RENCAP3	Our company can be described as a learning organisation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RENCAP4	The operations of our company can be described as creative and inventive.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

		1	2	3	4	5
TRUSCAP1	The way our company operates is characterised by an atmosphere of trust.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TRUSCAP2	We keep our promises and agreements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TRUSCAP3	Our company seeks to take the interests of its stakeholders into account in its operations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TRUSCAP4	The expertise of our company inspires trust in stakeholders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TRUSCAP5	The image and reputation of our company inspire trust in stakeholders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

		1	2	3	4	5
ENTCAP1	Risk-taking is regarded as a positive personal quality in our company.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ENTCAP2	Our employees take deliberate risks related to new ideas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ENTCAP3	Our employees are excellent at identifying new business opportunities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ENTCAP4	Our employees show initiative.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ENTCAP5	The operations of our company are defined by independence and freedom in performing duties.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ENTCAP6	Our employees have the courage to make bold and difficult decisions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

KNOWLEDGE MANAGEMENT PRACTICES

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

		1	2	3	4	5
KMLEAD1	Supervisors encourage employees to share knowledge at the workplace.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KMLEAD2	Supervisors encourage employees to question existing knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KMLEAD3	Supervisors allow employees to make mistakes, and they see mistakes as learning opportunities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KMLEAD4	Supervisors value employees' ideas and viewpoints and take them into account.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KMLEAD5	Supervisors promote equal discussion in the workplace.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KMLEAD6	Supervisors share knowledge in an open and equal manner.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KMLEAD7	Supervisors continuously update their own knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

		1	2	3	4	5
KPROT1	Our company's strategic knowledge is protected from those stakeholders to whom it is not intended	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KPROT2	If necessary, our company uses patents, agreements, legislation and other formal means to protect its strategic knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KPROT3	If necessary, our company uses confidentiality, employee guidance and other informal means to protect its strategic knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

To what extent do the following statements on strategic knowledge and competence management apply to your company? (1 = completely disagree, 5 = completely agree)

		1	2	3	4	5
STRATKM1	Our company strategy is formulated and updated based on company knowledge and competences.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STRATKM2	Our company strategy addresses the development of knowledge and competences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STRATKM3	Our company systematically compares its strategic knowledge and competence to that of its competitors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STRATKM4	Our knowledge and competence management strategy is communicated to employees clearly and comprehensively.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STRATKM5	In our company, the responsibility for strategic knowledge management has been clearly assigned to a specific person.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

		1	2	3	4	5
HRMREC1	When recruiting, we pay special attention to relevant expertise.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HRMREC2	When recruiting, we pay special attention to learning and development ability.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HRMREC3	When recruiting, we evaluate the candidates' ability to collaborate and work in various networks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HRMTD1	We offer our employees opportunities to deepen and expand their expertise.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

HRMTD2	We offer training that provides employees with up-to-date knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HRMTD3	Our employees have an opportunity to develop their competence through training tailored to their specific needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HRMTD4	Competence development needs of employees are discussed with them regularly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

HRMPAPP1	The sharing of knowledge is one of our criteria for work performance assessment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HRMPAPP2	The creation of new knowledge is one of our criteria for work performance assessment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HRMPAPP3	The ability to apply knowledge acquired from others is one of our criteria for work performance assessment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

HRMCOMP1	Our company rewards employees for sharing knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HRMCOMP2	Our company rewards employees for creating new knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HRMCOMP3	Our company rewards employees for applying knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

		1	2	3	4	5
LRNMECH1	Our company transfers knowledge from experienced to inexperienced employees through mentoring, apprenticeship and job orientation, for example.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LRNMECH2	Our company systematically collects best practices and lessons learned.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LRNMECH3	Our company makes systematic use of best practices and lessons learned.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

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

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

		1	2	3	4	5
WORKORG1	Our employees have an opportunity to participate in decision-making in the company.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
WORKORG2	In our company, work duties are defined in a manner that allows for independent decision-making.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
WORKORG3	We enable informal interaction between members of our organisation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
WORKORG4	Our company organises face-to-face meetings when necessary.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

WORKORG5 When necessary, we use working groups with members who possess skills and expertise in a variety of fields.
WORKORG6 When needed, our company makes use of various expert communities.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

BASIC COMPANY INFORMATION

R&DSHARE The proportion of research and development staff of all employees in 2012 (estimate of percentage between 0-100%): _____

PRODVSER In 2012, our company's net sales consisted of:
 1 2 3 4 5 6 7 8 9 10
 Product sales (100%) Service sales (100%)

HIGHEDU What proportion (to the nearest 10%) of your employees have:
 A higher education degree _____%

NEWCEO Has the managing director of your company changed during the past 24 months? No=0 Yes=1
 NEWINCM Has your company's primary source of revenue changed during the past 24 months? No=0 Yes=1

TANGBLTY In your evaluation, to what extent do tangible resources (such as machinery, equipment and property) and intangible resources (such as knowledge, expertise, contacts and processes) represent the resources your company uses in its operations?
 (1 = operations are completely based on tangible resources, 10 = operations are completely based on intangible resources)

1 2 3 4 5 6 7 8 9 10
 Tangible resources Intangible resources

To what extent can the following be described as the sources of your company's competitiveness? (1 = not at all, 5 = very much)

	1	2	3	4	5
TACITK Tacit knowledge and specialized expertise embedded in individuals and teams.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CODIFK Documented knowledge and standardised expertise that can be replicated quickly and efficiently.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>