THE ROLE OF INTANGIBLE ASSETS IN THE RELATIONSHIP BETWEEN HRM AND INNOVATION: A THEORETICAL AND EMPIRICAL EXPLORATION

TAMAR JINCHVELADZE
FELIX ZSCHOCKELT
MARTIJN VAN VELZEN
JAN KEES LOOISE

2009
Abstract
This paper, as far as known, provides a first attempt to explore the role of intellectual capital (IC) and knowledge management (KM) in an integrative way between the relationship of human resource (HR) practices and two types of innovation (radical and incremental). More specifically, the study investigates two sub-components of IC – human capital and organizational social capital. At the same time, four KM channels are discussed, such as knowledge creation, acquisition, transfer and responsiveness.

The research is a part of a bigger project financed by the Ministry of Economic Affairs and the province of Overijssel in the Netherlands. The project studies the ‘competencies for innovation’ and is conducted in collaboration with innovative companies in the Eastern part of the Netherlands.

An exploratory survey design with qualitative and quantitative data is used for investigating the topic in six companies from industrial and service sector in the region of Twente, the Netherlands. Mostly, the respondents were HR directors. The findings showed that some parts of IC and KM configurations were related to different types of innovation. To make the picture even more complicated, HR practices were sometimes perceived interchangeably with IC and KM by HR directors. Overall, the whole picture about the relationships stays unclear and opens a floor for further research.
1. INTRODUCTION

Estimates show that 50-90% of today’s firm outcomes do not come from the management of traditional physical assets but from the ‘management of intellectual capital’ (Dzinkowski, 2000). Today’s traditional financial accounting practices are more and more seen as an inappropriate tool to assess the overall value of a firm because they lacked the ability to highlight the value of intangible assets (Rastogi, 2003; Bontis, 2001). This becomes obvious in the fact that there is a wide divergence between market and book values of successful firms across a wide range of industries (Edvinsson, 1997; Rastogi, 2003). For example, Coca Cola, Intel and Wal-Mart had much higher market values than their actual book value (Fortune 2000, from Rastogi, 2003). This reflects the shift from the mass production economy to a more knowledge based economy and highlights the need for new ways of visualizing, measuring and managing intangibles (Bontis, 2001; Carson, Ranzijn, Winefield & Marsden, 2004; Tan, Plowman & Hancock, 2008). Intellectual capital (IC) is often seen as a proxy of the difference between market and book value of a certain firm and defined as ‘the total stock of capital or knowledge based equity that the company possesses’ (Dzinkowski, 2000).

In order to survive in today’s business environment which is often described in terms of uncertainty and rapid change (John, Cannon & Pouder, 2001) organizations need to innovate (Shipton et al., 2006). Organization’s capacity to generate and develop its strategic options (for instance to innovate) depends on its ‘meta-capability’ of leveraging IC (Rastogi, 2000). As the author states in this process knowledge management has been seen as a foundation of securing competitive advantage. Intellectual capital management takes care of overall intellectual assets in the organization from strategic perspectives, while knowledge management (KM) carries more ‘tactical and operational perspectives’ (Wiig, 1997, p.400). KM can also be considered as a prerequisite for IC, successful KM implementation should lead to better IC. KM has also been defined as a tool to generate wealth from organization’s intellectual capital (Bukowitz & Williams, 1999). This way KM becomes a part of IC (Ariely, 2006). Hence, we can argue that KM is a method, tool to achieve successful implementation of IC. KM can be considered a way how to facilitate IC processes. If collaboration, trust and networks are missing it will be hard to create and share required knowledge (Rastogi, 2000). In addition, KM activities can deal with how knowledge and skills be managed for the benefit of organization strategy. Managing innovation has become as in many other research areas an extensive topic in human resource management (HRM) where different scholars argue that people, not products, are an innovative company’s major intangible assets and that people must be seen as a “directly productive force” rather than “an element of a production system” (Gupta & Singhal, 1993; Shipton et al., 2006).

The purpose of this paper aims at how the different parts of human resource management, intellectual capital, knowledge management and innovation can be theoretically integrated in one research model. Having done this, the following of the paper aims at empirically investigating the relationships between these concepts. In more detail, what is the relationship of intellectual capital and knowledge management with two different types of innovation (incremental and radical innovation) and how can both intellectual capital and knowledge be developed and managed by human resource management practices? Therefore the central research question of this article can be stated as follows:
What is the relationship of both intellectual capital and knowledge management with different types of innovation (radical and incremental) and what types of HRM practices can be related to develop IC and KM in order to facilitate radical and incremental innovation?

2. THEORY AND CONCEPTS

2.1 Innovation

Very broadly, innovation can be defined as “the intentional introduction and application within an organization of ideas, processes, products or procedures, new to the unit of adoption, designed to significantly benefit the organization or wider society” (West & Farr, 1990). Innovation is considered to be a highly relevant outcome variable for organizations because innovative organizations are likely to gain competitive advantage (Tidd, et al., 2005). The shortened product life cycle makes it necessary for organizations to frequently develop completely new products and/or processes or to improve existing ones so that they stay ahead of competitors who try to imitate. To create new and better products or processes, organizations have to reallocate their resources and combine old with new resources in new ways (Tsai & Ghoshal, 1998). Innovation requires diverse resource inputs and combinative practices which makes resource exchange and cooperation as a requirement for innovation.

Different and numerous types of innovation can be found in the literature and researchers have different ways of distinguishing between these types. One distinction of frequently cited types exists between e.g. product and process innovation (Tidd et al., 2005). Product innovation includes changes in the things (products/services) which an organization offers (Boer & During, 2001; Tidd et al., 2005) whereas process innovation includes changes in the ways in which products or services are created and delivered. Product and process innovations can again be subdivided in the degree of novelty they involve. This is the classical dichotomy of radical versus incremental innovation. Radical innovation is considered with fundamental and revolutionary changes which require a clear departure from existing practices of how things get done and also fundamental adjustments to existing technology or the acquisition of new technology. Incremental innovation on the other hand contains minor improvements or just simple changes in how things get done over a long time. There are also just minor adjustments in the existing technology (Dewar & Dutton, 1986; O’ Reilly & Tushman, 2004).

The basic difference between those two forms of innovation is the degree of knowledge and skills embedded in these innovations. Whereas it is argued that incremental innovation is related to specialized, in depth knowledge and skills in one particular domain of employees, radical innovation is associated with more broad, general and multi-type knowledge and skills of employees which can be used across domains (Hall & Soskice, 2004; Kang & Snell, 2009).

The possession of in depth knowledge and high specific skill levels leads an organization to a narrower, in depth search for well defined and clear solutions pertinent to existing knowledge domains which in turn can be related to more exploitation and incremental types of innovation. In contrast, broad and general
knowledge combined with multi-type knowledge leads an organization to a broad and generalized search to expand current knowledge domains into new and unfamiliar areas which in turn can be related to more exploration. Exploratory learning refers to the generation of new ideas through the search for alternative viewpoints and perspectives (Shipton, 2006). This is likely to happen when employees are exposed to different internal and external parties of the organization. Exploratory learning can be related to more radical types of innovation (Kang & Snell, 2009). Based on the distinctions made above this research will concentrate on the classical distinction between incremental and radical innovation.

2.2 Intellectual capital
A frequently cited conceptualization of intellectual capital is based on the distinction between human capital, social capital and organizational social capital (Subramaniam & Youndt, 2005). Human capital is defined as the knowledge, skills, and abilities residing with and utilized by individuals (Schultz, 1961), whereas organizational capital is the institutionalized knowledge and codified experience residing within and utilized through databases, patents, manuals, structures, systems, and processes (Youndt et al., 2004). The third aspect, social capital, is defined as the knowledge embedded within, available through, and utilized by interactions among individuals and their networks of interrelationships (Nahapiet & Ghoshal, 1998). The initial idea for the conceptualization of intellectual capital in this study is based on the articles from Tsai and Ghoshal (1998) who investigated the effect of intra-firm networks on product innovation, Leana and Van Buren (1999) who introduced the new concept of organizational social capital and Kang and Snell (2009) who argue that different kinds of intellectual capital configurations can be linked to exploitation and exploration. This research addresses their implications to extend the studies in order to focus on different types of innovation and also different types of capitals. Therefore, the conceptualization of IC will include human and organizational social capital. The concept of social capital is modified in a minor way in comparison to common models of social capital in that it rather focus on the internal relationships and interactions between members within a specific company. This is what Leana & van Buren (1999) call organizational social capital. The focus will not be on relationships with customers or other external agents such as inter-firm networks which fall in the category of social capital defined by various authors as e.g. Ross et al. (1997) and Edvinsson (1997).

In the context of this study, human capital (HC) can be described as including the knowledge, skills, attitudes and intellectual agility of employees (Ross et al., 1997). But whereas it seems logic that employees need to overcome a minimum threshold of skills and knowledge to be innovative, the question remains what kinds of skills and knowledge can be related to certain types of innovation. The second component of HC is attitudes which are a vital aspect because employees with certain knowledge and skills do not always act in alignment with organizational goals (George & Jones, 2008). Rather, the accomplishment of organizational goals or objects also depends on employees’ willingness and motivation to use their skills and knowledge and share them. Further, innovations require diverse research or project teams. Work related knowledge and skills within the organization can be disseminated and shared through teams. If human capital (especially the knowledge component) is not networked, shared or channelled through relationships (organizational social capital), it bestows little benefits to the organizations in forms of innovation (Carson et al., 2004; Subramaniam & Youndt, 2005). Employees working
in an innovative organization should therefore favour and also be willing to work in teams (Shipton et al., 2006). The third sub-component of human capital is called intellectual agility. It refers to the ability to transfer knowledge from one situation to another, to use different sources of information, to link it together and the ability to improve both knowledge and company output through innovation and adaptation (Ross et al., 1997).

Whereas human capital of an organization might develop single creative ideas, the actual implementation of new products, processes or services is most of the time dependent on more than one person (Mumford, 2000). This brings us to the next relevant concept of intellectual capital which is called (organizational) social capital (Leana & van Buren, 1999). In this study, the emphasis will be on what Leana & van Buren (1999) call organizational social capital (OSC). OSC is defined as "a resource reflecting the character of social relations within the organization".

Organizational social capital is important because the knowledge and resources embedded in these relationships do not lie within one single employee. Much knowledge and resources from individuals will and have to be shared in a social context. This makes it an advantage for the organization because knowledge will not easily get lost and it is also unlikely that one person possesses all organizational knowledge (Bourdieu, 1985). In order to develop OSC, information and knowledge has to be shared in a social context. Not all employees are always willing to share their knowledge.

Leana and van Buren (1999) state that OSC has two sub-components which are associability and trust. An additional third factor will be introduced which represents the structural component and will address the configuration of different relationships within an organization.

‘Associability is the willingness and ability to subordinate individual goals and associated action to collective goals and actions’ (Leana & Van Buren, 1999). Employees must be willing to agree and able to act on collective goals. This is a crucial point because the sole existence of relationships and interactions in an organization does not imply that individuals really work together in order to achieve collective goals. It is a well known fact that every individual has its own preferences and goals at work (George & Jones, 2008). Kang and Snell (2009) argue that employees with specialized knowledge may tend to act on their own interests at the expense of the interests of the whole. If individuals rely too much on their own preferences and goals they might exhibit detrimental behaviour which will have a negative impact on the group or organization. The willingness to agree on collective goals must be combined with the ability to achieve these goals in a collective way through collective action. Work must be divided in a suitable and effective way and it must also be coordinated accurately in order to achieve the collective goals (Leana & van Buren, 1999). It is said that if employees have the same perceptions about what and how work must get done, possible misunderstandings can be avoided and there are more opportunities to exchange ideas and resources. Collective goals can be seen as a “bonding mechanism” which facilitates interaction and information sharing within the company.

The second component of organisational social capital, included here, is considered to be trust (Leana & van Buren, 1999). When someone says ‘You can trust me’, we
usually don’t trust people immediately. It takes a long time to develop trust which makes it really difficult to find ways or practices with which organizations can enable trust. But yet, trust is necessary for people to work together. The most important outcome of trust seems to be the willingness to share knowledge. Tsai & Ghoshal (1998) already showed that people are more likely to cooperate effectively and share information if they trust each other. This is crucial with regard to the skill and knowledge profile of employees. It is said that specialists are less likely to share their knowledge than generalists (Kang & Snell, 2009) which makes it obvious that practices should be created to facilitate trust with specialists. Trust can be defined as “an expectation or belief that one can rely upon another person’s action and words, and/or that the person has good intentions towards oneself (Dirks and Ferrin, 2001). Leana and van Buren (1999) distinguish between different types of trust within an organization.

The first subdivision can be made between resilient and fragile trust. Fragile trust is said to be ‘based on perceptions of the immediate likelihood of rewards’. Fragile trust transactions are often controlled by formal and contractual means. On the other side, resilient trust seems not to be evaluated on the likelihood of rewards but is rather based on the experience with the other party and the belief about their moral integrity of that party. In comparison to contractual means, transactions are here more controlled by norms and values of the relationship parties.

A second distinction can be made between dyadic or generalized trust. Dyadic trust can be defined as trust between parties which have direct knowledge about each other. Generalized trust relies to a lesser extent on direct knowledge about the other party but more on affiliation and reputation that rests with norms and behaviours that are generalized from others.

The third part included in the organizational social capital concept is the configuration of relationships and represents the structural dimension (Adler & Kwon, 2002). The configuration of relationships can influence the opportunity, the actual amount and the quality of getting access to knowledge from other parties (Kang & Snell, 2009). Two common and frequently used patterns exist to describe relationships within an organization. The first pattern includes the strength of ties which reflects the tightness of the members (mostly indicated by the frequency of interactions). The second pattern comprises of the network density which mirrors the overall redundancy of connections in the network (mostly indicated by who interacts with whom) (Kang, Morris & Snell, 2007). Relationships can be more tightly coupled with strong and intense network connections or more loosely connected with weak and non-redundant relationships (Ancona, Bresman & Kaeufer, 2002). In the next section, the concept of knowledge management will be introduced before both KM and IC will be related to each other and then linked to innovation.

2.3 Knowledge management
It is believed that KM helps create value by actively applying the expertise that is provided in individual minds (Cheng & Huang, 2007). Besides, it is the way of ‘doing the right thing’ rather than ‘doing things right’ (Civi, 2000, p.168). KM is the possibility of bridging gaps between what organizations know and what they do, in other terms, turning passive knowledge into active (Pfeffer & Sutton, 1999). The following definition has been formulated based on the understanding of KM from the majority of researchers: from organizational perspective knowledge management is the
process of full utilization of internal and external knowledge sources through KM channels (knowledge acquisition, creation, transfer and responsiveness).

Depending on the strategy of the organization the respective KM operations are selected (Rastogi, 2000). To be innovative and meet market demands organizations implement a set of following KM activities: knowledge creation, acquisition, transfer and responsiveness. Knowledge management must be seen as a circular process in relation to intellectual capital. One can state that knowledge management in terms of for instance knowledge creation can facilitate the creation of the capital forms. But also existing configurations of capitals for instance in terms of broad skills can facilitate the acquisition and creation of new knowledge from different domains. The reasoning lying behind this will be outlined in the below sections.

For the interest of this research internal knowledge sources are associated with human capital, specifically in terms of specialist and generalist knowledge that was elaborated above. External knowledge sources can be all the stakeholders of the organization or sources of information coming outside of the organization, such as customers, suppliers, competitors, market etc. (Darroch, 2003).

a. Knowledge creation
Knowledge creation is about acquiring new concepts and new understanding ‘by overcoming individual boundaries and constraints imposed by information and past learning’ (Saenz, Aramburu & Rivera, 2009, p.23). It is about generating or discovering knowledge (Rastogi, 2000, p.41) through various activities. Three features can be critical for knowledge creation: experience, learning and teamwork. Pre-existing knowledge influences greatly how new knowledge is encoded (Swap, Leonard, Shields & Abrams, 2001). The importance of experience can be very typical for specialists, especially for firm-specific knowledge holders. They’re the ones who accumulate organization specific skills through practice, experience. On the other hand, there is an assumption that a lack of shared experience can be critical for developing new ideas (Majchrzak, Cooper & Neece, 2004). As it can be argued based on these authors, lack of shared experience means having various, different experiences in a group of employees. We assume that this notion can be characteristic for generalist knowledge holders since they possess the knowledge which is not based on specific firm experience, rather than general understanding.

However, to become an expert it requires at least 10 years of experience to develop (Swap, Leonard, Shields & Abrams, 2001). It has been argued that learning is the process when new knowledge is created (Darroch & McNaughton, 2002; Dove, 1999; Lee & Choi, 2003; Kamoche, 1997). Two types of learning have been recognized: single-loop or exploitative learning and double-loop or explorative learning (Lado & Wilson, 1994). The authors argue that the first refers to “learning by repetition approach” when employees accumulate knowledge, skills and ability after years of service in the organization (p.706). On the other hand, double-loop learning permits organizational members to question existing performance standards, norms and beliefs.

It has been recognized that collective, teamwork is a very efficient way of knowledge creation (Osterlof, 2007). “A team is a group of people with a common goal, interdependent work, and joint accountability for results” (McDermott, 1999, p.2). It
has been argued that cross-functional teams quickly handle problems, and promote organizational creativity and learning (Schelfhaudt, & Crittenden, 2005).

b. Knowledge acquisition
Knowledge acquisition is an activity when knowledge is identified in the entity’s environment and makes it available for an appropriate activity (Holsapple & Joshi, 2004). Knowledge acquisition can be fundamental for new knowledge generation, it can become a source or a basis for building new concepts or ideas. It includes obtaining knowledge from internal and external sources. On the other hand, it is important that information is collected from market, customers and competitors (Darroch, 2003). Knowledge acquisition from external sources can be beneficial for further new knowledge creation and application (Shipton, West, Dawson, Birdi & Patterson, 2006). As the authors cite, this information can be beneficial to find out future needs of customers and later align certain practices to bridge the gap of knowledge requirements and thus innovate to meet the needs of customers.

c. Knowledge transfer
Knowledge dissemination can help to transfer the created knowledge at the individual or group level within the whole organization (Nonaka & Takeuchi, 1995). This can facilitate creation of new knowledge and enabling innovation (Saenz, Aramburu & Rivera, 2009). The dissemination of market knowledge is important because it forms a common ground for different departments to perform on a shared basis (Kohli & Jaworski, 1990). Knowledge can be transferred in a codified or personalized way (Hansen, Nohria & Tierney 1999; Saenz, Aramburu & Rivera, 2009). The aim of the codified knowledge is to organize knowledge, make it explicit, store into databases so that anyone can access and use it (Hansen, Nohria & Tierney 1999; Ribiere & Roman, 2006). IT infrastructure provides timely, rich and accurate information to the users (Hansen, Nohria & Tierney 1999; Rastogi, 2000). People-focused or personalization approach incorporates creating networks, dialogues so that people can be connected and share knowledge. This strategy places moderate focus on IT (Ribiere & Roman, 2006). The knowledge which cannot be codified is transferred through face-to-face communication and brainstorming but not only by these techniques, even IT tools are used for personalization approach to share knowledge and communicate rather than store it (Hansen, Nohria & Tierney 1999).

d. Knowledge responsiveness
Knowledge responsiveness means that organization responds to the various types of knowledge it acquires or has access to (Darroch, 2003). Knowledge can be acquired and shared but little can be achieved if it’s not responded (Dove, 1999; Kohli and Jaworski, 1990). Speed of responding to acquired knowledge can be decisive for the organization (Dove, 1999).

Thus, knowledge management channels form a circular environment and this relationship forms a continuum, similar to the ‘spiral of organizational knowledge creation’ by Nonaka (1994, p.20). However, we will argue later that from different KM channels knowledge creation carries most valuable meaning for the benefit of innovation in the company; the rest channels can be defined as supporters of this process. Holsapple and Joshi (2004) describe the knowledge generation process as an entire practice of acquisition, transfer and responsiveness.
2.4 Intellectual capital, knowledge management and innovation

Intellectual capital and knowledge management are recognized as driving forces for innovation. It is believed that the firms which affectively acquire, disseminate and apply knowledge support the creation of learning environment where constant improvement of processes take place. Active learning and sharing of experience lead to creativity and fast response to market requirements; these activities become prerequisites for innovation in the company (Carneiro, 2000; Chen & Huang, 2007). CEOs in US companies agree that “knowledge-based assets will be the foundation of success in the 21st century” (Wiig, 1997, p.399).

The question is which KM channels and configurations of intellectual capital are most important for supporting innovation? Researchers admit that knowledge creation and knowledge transfer have important implications for innovativeness (Krogh, Ichijo and Nonaka, 2000; Lee & Choi, 2003; Popadiuk and Choo, 2006; Ruggles and Little, 1997). But how can knowledge creation and dissemination components promote different types of intellectual capital and innovations? In the following it will be argued how different channels of knowledge management (knowledge creation and knowledge dissemination) and different configurations of intellectual capital can be linked to different types of innovation. Three different factors of the knowledge creation process are the focus of attention in the following: experience, learning, teamwork.

We can assume that experience can be a supporter of exploitative innovation, while the lack of shared experience can be critical for explorative innovation. To discuss each of the assumption in more detail it can be stated that first of all that for exploitative units experience matters. Reflecting on past lessons and adapting current practices accordingly can contribute to incremental innovation. The reasoning is that pre-existing knowledge supports development of existing knowledge domains with the similar practices of experience (Subramaniam & Youndt, 2005). Besides, new knowledge can be formulated based on combination and sharing of existing knowledge (Bhatt, 2001; Bartol & Srivastava, 2002; Cohen and Levinthal, 1990). In contrast to this notion it is argued that lack of shared experience can facilitate the success of explorative innovation (Majchrzak, Cooper & Neece, 2004). This assumption is based on the understanding that absorbing completely new ideas without bias of known practices around the subject can lead to new knowledge generation. Researchers argue that for coming up with drastically new ideas employees find solutions in other domains that have nothing to do with their main domain (Majchrzak, Cooper & Neece, 2004). This means that knowledge creation for explorative innovation requires incentives to search for new knowledge domains in order to integrate with existing ones for new insights leading to forming new ideas. The incentives can be lack of shared experience. Besides, lessons learned through innovation project management can bring beneficial source for new knowledge generation (Saenz, Aramburu & Rivera, 2009). It means that there is a reciprocal relation between knowledge generation and innovation.

With regards to learning as another factor for knowledge creation, we have earlier connected single-loop learning with specialist knowledge holders and double-loop learning with generalist knowledge holders. To discuss each of the assumptions we should state that single-loop learning requires experience, so that employees learn by repeating their existing activities, this we can assume can ensure the quality of their work by finding new ways how to improve, brush up existing tasks by performing
them in more qualified way. Accordingly, we can assume that it is more connected to exploitative innovation where incremental changes are characteristic. On the other hand, as discussed earlier double-loop learning requires questioning existing activities, reflecting on their actions, while having general knowledge about other domains as well, they can find new solutions, ideas to improvise their actions and create drastically different knowledge from existing activities. This leads us to argue that double-loop learning can be a supporter of explorative innovation.

Forming teams by individuals with diverse knowledge and expertise can be beneficial for explorative innovation. Employees should be able to think in a broad way in order to link their knowledge with the one of a team member (Gupta & Singhal, 1993). Besides, creativity formed in the mind of an individual can be analyzed in teams to develop this idea. These types of groups are considered as strong creators and disseminators of innovative ideas (Lopez-Cabrales, Perez-Luno & Cabrera, 2009).

The distinction arguments mentioned above can also be related to human capital. In line with Hall and Soskice (2004), Kang and Snell (2009) argue that domain specific knowledge and skills can be related to the more effective acquisition and assimilation of new, in depth knowledge within a narrow range of parameters. This can be connected to exploitation and incremental types of innovation (O’Reilly & Tushman, 2004). On the other hand, generalist human capital with its multiple knowledge domains tends to have more various mental models and less cognitive conflict which makes possible a varied interpretation of problems and situations. Broad knowledge also enables discovery, comprehension, combination and application of new knowledge from different domains. This all can be related to explorative learning and explorative organizations are related to radical innovations (O’Reilly & Tushman, 2004). This is in line with Hall and Soskice (2004) who on a more institutional or national level of analysis, argued that different skill profiles are related to different kinds of innovation. Incremental types of innovation are more likely to be found in coordinated market economies (e.g. Germany & The Netherlands) where employees have highly firm or industry specific skills whereas radical types of innovation are often found in more liberal market economies (e.g. USA & UK) where employees have a broader skill profile. Schuler and Jackson (1987) more generally, in comparison to Hall and Soskice (2004) state that organizations pursuing an innovative strategy should allow employees to develop skills which can also be used in other functions in the organization. Existing general knowledge can be used to develop completely new products or processes or to improve existing ones.

Even if there is no clear opinion about the effectiveness of team work in general, with respect to innovation, team work is said to be an important requirement (Jimenez-Jimenez & Sanz-Valle, 2008; Laursen & Foss, 2003). Based on the distinction between general and specific knowledge and skills, one can argue there can and will be two different types of attitudes linked to the different skill and knowledge types. Specialists are said to be less likely to share knowledge in comparison to generalists (Kang & Snell, 2009). That highlights a crucial drawback for innovative firms in managing differently educated employees. Even if scholars argue that knowledge sharing can be related to innovation in general (Sáenz, Aramburu & Rivera, 2009), it can be argued that a combination of general knowledge and skills with a more positive knowledge sharing attitude can be more related to radical innovation. Vice versa, a combination of specific knowledge and skills with a lower level of knowledge sharing attitude can be more related to incremental innovation. Additionally, because
team-work is crucial for innovation in general, it could be argued that specialists may not see team work as important as in comparison to generalists because specialists are less likely to share knowledge. And teamwork is obviously associated with combining and using different sources of knowledge and skills.

Because exploration and radical innovation demand fundamental and revolutionary changes which include a clear departure from existing practices (Dewar & Dutton, 1986; O’Reilly & Tushman, 2004), employees and the organization on general need to take risks. Therefore, employees should possess an “error embracing” attitude because radical innovation projects may be highly ambiguous and it takes long times to see the outcome effects of these projects. This is in line with Gupta and Singhal (1993) who state that innovation in general needs a sense of risk taking. If employees or the organizations do not take these risks, possible innovations will be forgone. But in comparison to radical innovations, incremental innovations may be related to a more rule following and “error avoiding” attitude of employees. Employees who have to follow stricter working guidelines and rules may have standardized processes of how work will be done. These standardizations and rules may bias problem solving activities because employees may use decisions that have previously been found to be useful. The reliance on previously used methods and decisions may lead to smaller, minor changes in products or process which are associated with incremental innovations (Kang & Snell, 2009).

More specific in terms of incremental and radical innovation, the ability to combine different sources of knowledge or information, the sharing of it and the ability to improve it seem to be more relevant for radical than for incremental innovation. That does not imply that intellectual agility is not relevant for incremental ability but it seems to be even more significant for radical types of innovation for the following reasons. The general skill and knowledge characteristics associated with radical innovation imply that generalists possess and make use of more different sources of internal and external knowledge than specialists. To develop a radical new process or product, these different sources or knowledge domains have to be combined in order to achieve coherence. Vice versa, it may be the case that this ability may be to a lesser extent important for incremental types of innovation than for radical types of innovation. In fact, Kang and Snell (2009) argue that specialists may be less likely to master knowledge across different domains in comparison to more generalists.

To sum up, double loop learning, the lack of experience and cross functional teamwork could be linked to the creation of generalist human capital. This capital configuration which includes general skill and knowledge, attitudes of team work orientation, knowledge sharing and error embracing and the ability to combine different external sources of information for successful generation of new ideas can be linked to radical innovations.

In contrast, single loop learning and the existence of experience can be related to specialist human capital. This capital type includes deep and embedded skills and knowledge in one particular domain, a lesser extend of team work orientation, reluctance to share knowledge, a more “error avoiding” attitude and the difficulty to master knowledge across different domains. This in turn may be related to incremental innovation. Based on the reasoning above following two sub-questions are stated:
1) How far can single loop learning, experience and specialist human capital be related to incremental innovation?

2) How far can double loop learning, lack of shared experience and generalist human capital be related to radical innovation?

A second relevant concept in the relation of knowledge management, intellectual capital and innovation is knowledge dissemination. If we define the factors for knowledge transfer process, we can argue the connection of codification strategy with exploitative innovation and personalization strategy with explorative innovation. The researchers argue that companies focusing on standardized or mature products are more inclined to use codification strategy, on the other hand, the companies emphasizing customized or innovative products use personalization strategy (Ribiere & Roman, 2006). We can assume here that standardized or mature products incorporate incremental improvements, minor changes to keep status quo, whereas customized and innovative products can be understood as those which include major changes in order to meet customer demands and innovate constantly with drastic inventions if required. In addition, the above cited authors state that the codification strategy is focused on explicit knowledge. On the other hand personalization strategy should be used for those organizations where tacit knowledge is important, since tacit knowledge resides in persons (Hansen, Nohria & Tierney 1999). Popadiuk and Choo (2006) claim that tacit knowledge is closely related to exploration and conversely, explicit knowledge to exploitation where communication is more codified and formalized. Based on this, we can conclude that codification strategy might be a supporter for exploitative innovation, while personalization strategy might enhance explorative innovation. Based on the above analysis the following sub-questions can be formulated:

3) How far can codification strategy support exploitative innovation?

4) How far can personalization strategy support explorative innovation?

According to organizational social capital, Kang and Snell (2009) claim that two different configurations can be related either to exploration or exploitation. These configurations can also be attributed to the organizational social capital concept of Leana and van Buren (1999). For reasons of simplicity, they will be labelled as entrepreneurial OSC and cooperative OSC (Kang & Snell, 2009). OSC is said to contribute to the overall effectiveness of groups and organizations by reducing transaction costs, especially search, information, bargaining and decision cost. (Organizational) social capital can enhance a person’s or group’s acquirement of external knowledge (Wu et al., 2007) which is important for “outside the box” thinking. Tsai & Ghoshal note that social interaction within organizations may allow innovators to cross formal lines and levels to find what they need. But social capital allows not only the reliance on prevailing knowledge but also the redefinition of the evolving body of this knowledge. Whereas Leana and van Buren (1999) argue that social capital can also be barrier for innovation because long-term relationships, ways of operating as well as strong norms and specific roles may resist change we argue that different characteristics of OSC can be related to different types of innovation.

Specifically, incremental innovation is said to be enhanced by cooperative OSC which is configured by a tightly coupled system with strong and dense network connections, generalized trust based on membership and a rule following culture or strict reliance on more formal rules which reinforce efficient coordination. Strong and
dense relationships are a favourable condition for sharing redundant but highly specialized knowledge because the high frequency of contacts enables employees to get access to idiosyncratic knowledge in particular domains (Kang, Morris & Snell, 2007; Ancona, Bresman & Kaeufer, 2002). Generalized trust enables employees to rely on and to cooperate with each other even if they do not have direct personal experience with each other. This is a valuable characteristic because exploitation, the deepening and refining of knowledge in certain domains, requires interdependent parties to cooperate as cohesive groups. Overall, the cooperative OSC configuration is argued to support efficient acquisition and integration of specialized, in depth knowledge, which facilitated exploitation and incremental types of innovation (Kang & Snell, 2009).

The second configuration which is labelled entrepreneurial OSC is more related to radical innovation. It is characterized by weak and non-redundant relational networks as well as resilient dyadic trust that is developed through direct personal experience. There is likely to be more reliance on collectively agreed goals and actions than on formal rules and employees have the opportunity and autonomy to define both the way work is organized and done. Strong and dense social relations may reduce the ability of employees to explore varied knowledge domains and to acquire more general and knowledge because strong and dense social relations may lead employees to a more narrow view with a lack of a more general “helicopter view” (Kang & Snell, 2009). More weak and non-redundant relationships may allow employees to be less embedded in relationships, thereby giving them the flexibility required to expand, acquire and absorb novel and diverse knowledge domains (Kang, Morris & Snell, 2007; Ancona, Bresman & Kaeufer, 2002). Dyadic trust in turn requires less effort to build as well as limited commitment and therefore enables employees to develop weaker relationships that enable employees the access to more general knowledge from multiple domains and sources. Therefore, if organizations want to explore new ideas or solutions, dyadic trust guarantees the access to various but rather general sources of knowledge. Interesting to note, Hall and Soskice (2004) argue that a focus on more collective goals and action would rather lead to more incremental types if innovation. The reason therefore is that a more stakeholder model of corporate structure would cost time and effort to achieve agreement. In their opinion, the shareholder model of corporate structure can be linked to more radical innovations because formal rules and the power of top down decision making will be more likely to enable the organization to make direct radical changes. Based on the argumentation above the last two sub-questions are stated:

5) How far can entrepreneurial OSC be related to radical innovation.
6) How far can cooperative OSC be related to incremental innovation.

2.5 HR practices in relation to knowledge management and intellectual capital
We’ve already mentioned the importance of knowledge management and intellectual capital in the relation with innovation. The upcoming question is: How can KM and IC be developed and managed? What strategy is necessary for this? What practices should be implemented to support this process? Research shows that introduction of proper human resource activities plays an important role in knowledge management and intellectual capital (Kang, Morris & Snell, 2007; Soliman and Spooner, 2000; Scarbrough, 2003; Kang & Snell, 2009). As Scarbrough (2003) states, innovation arises at the intersection of knowledge flow and people flow. HR flow will promote
knowledge sharing and shaping the skills of the individuals. Knowledge flow will support transfer and sharing of knowledge intra-organizationally that can become a link to innovative behavior.

Gupta and Singhal (1993) identified four dimensions of HRM strategies fostering creativity and innovation. For the relevance of this study the following HR-practices out of their dimensions have been selected since they are argued to be important for KM, IC and innovation:

1) Training
2) Performance appraisal
3) Job rotation

Training
Training can play an important role in bridging the gaps between what knowledge and skills an organization has and what knowledge and skills is needed (Soliman & Spooner, 2000). But again, the question is - how can training be structured to facilitate generation of new knowledge, skills and relationships which are so important for innovation?

Training can have different purposes, among those, serving to develop general or specific skills of employees (Guidetti & Mazzanti, 2007). Training focused on developing skills beyond existing job requirements limited might contribute to generalist knowledge development (Kang & Snell, 2009). If training is not to one position and incorporates experience from other positions as well the employee gets broader vision of the organization, this type of approach in training system facilitates creation of common ground in the enterprise. On the other hand, intensive training focused on improving of current job-related skills might contribute to develop specialized knowledge and expertise (Bae & Lawler, 2000). While extensive training designed to meet future skill requirements can increase general skills (Guthrie, 2001).

Based on this, we can argue that specific skill development training can boost contribute to single-loop learning and specific human capital, while general skill development training can facilitate double-loop learning and general human capital. The reasoning behind is that while providing intensive training to develop specific know-how of employees they engage in brushing up their existing skills to improve them or build up new competencies. On the other hand, providing extensive training which can support development of skills out of their current occupation can stimulate employees question existing rules and develop divergent insights or competencies.

The importance of a team based application of training to develop knowledge and skills necessary for innovation is highlighted in various studies (Jimenez-Jimenez & Sanz-Valle, 2008; Laursen & Foss, 2003). Team-based training, not necessarily with its own project team or department, rather than individual training will be likely to enhance different parts of human capital (competences: learn from other people; intellectual agility: use information from other people and integrate it in problem solving) and organizational social capital (development of weak or strong ties, trust and associability) (Hollenbeck, DeRue & Guzzo, 2004). Training can be designed with team members from different department (heterogeneous) or team members from the same department (homogeneous). Working in teams with people from
different departments with different competencies (heterogeneous) can stimulate sharing of more broad skills and knowledge between employees during the training. In contrast, training with homogeneous groups might facilitate more in depth development and sharing of in depth skills and knowledge. Therefore the following sub-questions can be formulated:

7) In how far can heterogeneous training focused on developing skills beyond current job-related skills be related to double-loop learning and general human capital?
8) In how far can homogeneous training focused on improving current job-related skills be related to single-loop learning and specific human capital?

**Performance appraisal**

One of the major purposes of PA is to aid employees in improving organizational performance (Cummings & Schwab, 1973). As stated above, it becomes clear that performance appraisal is likely to increase the human capital (through detecting performance gaps and improving knowledge and skills) which in turn could foster different types of innovation. On general, performance appraisal can be subdivided into separate categories such as individual vs. collective, short-term vs. long-term and result vs. process appraisal and error avoidance vs. error embracing appraisal. These different forms of appraisal may be linked to different configurations of IC and KM in the following ways.

Performance appraisals that focus on collective achievements may be more likely to enhance and also more suitable for strong and dense ties of networks within the organization as well as generalized trust (cooperative OSC). Individual performance appraisal in turn is more associated to stimulate employees to focus on their own performance which can have negative effects on the overall goal of the team or organization as well. Individual appraisal could stimulate employees to build various weaker relationships to get access to different knowledge domains, in turn to increase the possibility of good performance.

Other questions according to performance appraisal arise whether it should be short or long-term oriented and process or result oriented. Because incremental innovations are associated with small, non revolutionary changes it can be argued that incremental innovations could be more related to short-term appraisal with more appraisals than once a year. Short-term appraisals may be suited for an “error avoidance” (specialist HC) attitude because people performance is frequently appraised and suggestions for further improvement could be given. Radical innovations may be more related to long-term appraisals (generalist HC). These long-term appraisal would give employees the necessary room and empowerment for explorations and also stimulate an “error embracing” attitude because employees would not be monitored as frequently as employees who are appraised on a short-term basis.

With respect to process or result oriented appraisal, one could argue that result oriented appraisal would fit more to radical innovation, because employees are judged by the final result and not by the way how they invented or implemented it.

On the other hand, a process orientated appraisal can also be related to innovativeness but to the more incremental types of innovation because the focus is
on how thing were achieved and improved. PAs based on process evaluation might help provide more information to explain the results an employee achieved, “e.g. behavioral observation scales” (Kang & Snell, 2009, p.81). Besides, the focus on error avoidance during the evaluation might ensure preciseness of performance and more responsibility (Kang & Snell, 2009). This type of evaluation will be based on details and quality of performance. This kind of PA might be beneficial for specialist knowledge holders since they’re focused on specific knowledge domains and are required to be precise and organized in performance. They’re supposed to ensure quality, hence, errors should be avoided so that preciseness and effectiveness are facilitated. In the knowledge creation section, we’ve connected specialist knowledge with single-loop learning process and the value of experience for them. Accordingly, we can argue that PAs based on process evaluation and error avoidance might contribute to single-loop learning. The reasoning is that single-loop learning or exploitative learning is based on refinement, efficiency and extension of existing competencies and knowledge (March, 1991). Besides, avoidance of errors in performance appraisals can boost employees to be focused again on excellence of the performance, thus ensuring constant improvement and development of existing activities. Based on this the following sub-question can be formulated:

9) How far can process evaluation and error avoidance support single-loop learning and specific HC?

Contrariwise, result oriented appraisal may give employees the necessary room for exploration. Motivation for further development is crucial for employees in learning organizations. Hence, during evaluation focus should be placed on outcomes and positive achievements rather than critique of the reached outcomes (Mumford, 2000). It should be taken into account that employees trying to find best solution might use different rather than established norms to achieve objectives. This is an opposite approach from earlier stated proposition about the focus on process of achievement. Focusing on already achieved outcomes without stressing the ways, tactics, methods and tools used to achieve those results can support different purposes of performance. These purposes can be stimulation of employee flexibility to use his/her own ways in order to achieve certain results. This attitude can support employee autonomy and can encourage employees to search for divergent ideas, new ways for achieving better results. This type of PA can be beneficial for developing generalist knowledge since they’re possessors of knowledge from diverse knowledge domains and more able to absorb new information, digest and create into something different. PA can evaluate how well generalist knowledge holders absorb new information, how often they offer new creative ideas and whether they try to observe the actual work of their colleagues. Earlier we’ve connected generalist knowledge with double-loop learning, the process when employees question existing norms and practices and search for new possibilities, new ways of thinking to change the status quo, to experiment with new alternatives (March, 1991).

Learning is the part of knowledge transformation and sharing process, however the action is often accompanied by errors or failures. Past mistakes can be good lessons for future improvement and essential elements for learning (Yahya & Goh, 2002). Hence, ‘forgiving’ for certain mistakes might bring positive outcomes in the long run. This will help employees take risks, try new initiatives, fail but learn from the experience (Gupta & Singhal, 1993).
As stated above, teamwork is crucial for knowledge creation process. We’ve discussed already the features of teamwork and its essence. Team members know more about the capabilities of an employee. In order to achieve common objective of a team, avoidance of free riders is important (Gupta & Singhal, 1993). Peer feedback might play important role in creating complete evaluation of an employee and improving the performance of teams. Besides, it can provide important information about the individual contribution to the teamwork in order to align follow-up activities such as, rewards or trainings (Gupta & Singhal, 1993).

Based on the above analysis we can argue that performance appraisal which is based on evaluating outcomes of performance, error tolerance and stimulation of teamwork can promote double-loop learning and generalist HC. The reasoning behind is that when employees know that they have a flexibility to use their own ways to achieve results, when their flaws will be tolerated, when their peers will be included in evaluation, they will probably be more flexible to search for new alternatives of achieving results and they will try to collaborate with colleagues or direct team members to share and learn from them. Based on above review the following next sub-question can be formulated:

10) How far can the performance appraisal focused on evaluating performance outcomes, including peer feedback and error-embracing practice support double-loop learning and generalist HC?

**Job rotation**

Job rotation gives possibility to the employees to become familiar with the specificity of other positions that can improve the understanding of organization characteristics and objectives. New ideas emerge when people are well aware about the organization, its products, production processes and the market (Mumford, 2000).

Organizations use different forms of job rotations, some utilize cross functional teams for certain projects to ensure that knowledge is exchanged, at the same time providing space for learning from shared experience. Jobs can be shifted between the same areas of specialization or between different departments. Clearly, the opportunity for organizations to rotate core employees to other areas of specialization may be limited because the existing knowledge and skills within these employees are highly specialized and may not be useful in many other functions or departments. Shifting jobs between the same areas of specialization can refine the level of expertise between employees since they will share their professional insights and experience with other people in the same specialization and support mutual learning.

We can argue that shifting jobs between different areas of specialization can support double-loop learning, the development of generalist human capital and bringing divergent insights from shared experiences. It is vital for innovative companies that employees possess extensive capabilities (Schipton, 2006). “Through job rotation employees can achieve the attitudinal change required to question and challenge existing ways of operating” (Schipton, 2006, p.5). This will support creating new ideas to meet the strategy of innovation (Mumford, 2000). Laursen and Foss (2003) argue that “job-rotation among different engineering offices, as well as between engineering jobs and supervisory jobs at the factory, facilitates the knowledge-sharing needed for horizontal coordination among the different phases of development” (Laursen and Foss, 2003, p. 256). Consequently, job rotation between different departments might
be beneficial for generalist human capital and double-loop learning. Employees rotating in other areas of specialization acquire new perspectives of existing knowledge domains, but at the same time bring their experience there. Based on this analysis we can formulate the following sub-questions:

11) How far can job rotation within the same areas of specialization facilitate single-loop learning and specialist human capital?
12) How far can job rotation between different areas of specialization facilitate double-loop learning and generalist human capital?

Table 1: Theoretically proposed relationships

<table>
<thead>
<tr>
<th>Human Resource Practices</th>
<th>Intellectual capital &amp; Knowledge management</th>
<th>Innovation</th>
</tr>
</thead>
</table>
| • Job rotation within one area of specialization | • Specialist HC  
• Single loop learning | • Incremental innovation |
| • Job rotation between different areas of specialization | • Generalist HC  
• Double loop learning | • Radical innovation |
| • Specific Training              | • Specialist HC  
• Single loop learning | • Incremental innovation |
| • General Training               | • Generalist HC  
• Double loop learning | • Radical innovation |
| • Homogeneous Training           | • Specialist HC  
• Single loop learning | • Incremental innovation |
| • Heterogeneous Training         | • Generalist HC  
• Double loop learning | • Radical innovation |
| • Process appraisal              | • Specialist HC  
• Single loop learning | • Incremental innovation |
| • Result based appraisal         | • Generalist HC  
• Double loop learning | • Radical innovation |
| • Error avoiding appraisal       | • Specialist HC  
• Double loop learning | • Incremental innovation |
| • Error embracing appraisal      | • Generalist HC  
• Double loop learning | • Radical innovation |
| • Individual appraisal           | • Specialist HC  
• Single loop learning | • Incremental innovation |
| • Group appraisal                | • Generalist HC  
• Double loop learning | • Radical innovation |
| • Short term appraisal           | • Specialist HC  
• Single loop learning | • Incremental innovation |
| • Long term appraisal            | • Generalist HC  
• Double loop learning | • Radical innovation |
3. DATA ANALYSIS

3.1 Unit of analysis
In order to collect data, we used a criterion-based selection (cf. LeCompte & Preisse, 1993). Six participating organizations were selected for the data collection in the Twente region, located in the eastern part of the Netherlands. In selecting the units for our study we used as a criterion the need for innovation, rather than merely innovative organizations. As stated in the literature review section of this paper, innovation can be defined as a need for any organization for sustaining its competitive advantage. For this purpose the organizations were selected from two different economic sectors (manufacturing and service industries). Out of six organizations, four were profit organizations and two non-profit organizations. In addition to industry, organization size in terms of number of employees differed as well. The respondents were initially chosen from within Human Resource departments. Most of them were HR directors, one was the general director. Prior to the interviews, background information on the research project was sent to all participants for more information and as a reference during the interviews. The respondents were contacted and interviews were carried out in the period July-August 2009.

3.2 Method and instrument
We used a triangulating research approach, combining qualitative and quantitative methods. Face-to-face in-depth interviews were followed by a questionnaire. Here, the reasoning was that the interviews were supposed to give a broad understanding about the views and insights of participants regarding the research variables. Besides, it could give them better understanding of the concepts and whole research for further ensuring clarity of questions when filling out questionnaires. In addition, it is believed that two different types of methods can compensate the weak sides of each kind of research (Cooper & Schindler, 2008). Twenty-four items were included in the interview protocol. Interviews were semi-structured. The duration of each
interview was approximately 60 minutes. Due to the international background of the researchers interviewees were asked beforehand if the interviews could be done in English even if the interviewees were not native English speakers. All of the participants agreed. Nevertheless, interviewees were allowed to use their native language if problems with explanations arose during the interview. Each interview was recorded with the permission of respondents and transcribed. The detailed transcriptions were sent to all companies for their confirmation or comments to eliminate misunderstanding and was used for data analysis. Open questions were designed in a way that general attitudes and insights were caught towards each variable. Considering the suggestions by Waldman et al. (1998) we ensured reliability by using interview protocol in a way that questions were asked in the same sequence to all respondents. First, participants were asked if they recognized the existence of certain variables in the company and were asked to describe main features of them. Other questions referred whether companies set priorities on certain characteristics. Then, they were asked to describe the value of those variables and if they experienced a need to improve them in the future.

Interviews were followed up with detailed questionnaires. Participants were given the freedom to fill them out in collaboration with other employees but had to notice that. Questionnaire was based on a five point Likert scale, however open ended questions were also included for the acquisition of thorough data. Questions included constructs adopted from previous researches, but mostly they were structured specifically for this research, using unique constructs.

For this research, a questionnaire was structured in a way to measure the existence of IC constructs, KM practices, two types of innovation (explorative and exploitative) and HR practices (performance appraisal, training and job rotation). For the assessment of our outcome variable the questions were posed to ask the percentage of revenue coming from completely new products and the percentage of revenue coming from improved products. For measuring IC constructs, questions where constructed based on Ross et al. (1997), Subramaniam & Youndt (2005), Leana & Van Buren (1999), and Kang & Snell (2009). For measuring knowledge management channels (acquisition, creation, dissemination and responsiveness) the constructs were used from studies by Darroch (2003) and Saenz, Aramburu & Rivera (2009). The questions measuring HR practices and pre-conditions were constructed specifically for this research. In addition to interviews, annual reports, organizational charts and company websites were used.

3.3 Results
The purpose of this paper was to investigate how and if different configurations or practices of intellectual capital, knowledge management and human resource management can be related to the two distinct innovation types. General findings about the research showed that respondents did not have a clear picture about the different research concepts even if they claimed to have it at the beginning. After giving more detailed explanations to prevent misunderstandings, mostly it was found that all the research variables were present in all of the companies to different degrees. All of the companies for instance indicated that human resource practices, human and organizational social capital, knowledge management and innovation are highly important and valuable. Noticeably, all of them stated that there is always the challenge for improvement even if there is not a dramatic need for it. To structure the further analysis, the six investigated companies can be sub-divided into two clusters
according to the sector they are belonging to. Three companies were more industrial organizations whereas the other three were service organizations. This subdivision may help us see the differences in outcomes (if any) between these two sectors.

According to the findings we made on innovation, the first striking result from the interview data was that only one company can be said to have a strategy for innovation. The majority was found not to even have an R&D department. Expect for one company, all participants perceived their innovative performance as good with the awareness for further need for improvement. But there was no priority for any certain type of innovation from the two mentioned ones. Companies from the service sector were found to be generally more innovative (in terms of both types of innovation) than the industrial companies. According to the two types of innovation, incremental innovation was found to be higher than radical innovation in both sectors. Two companies (one from each sector) explicitly stated that the number of ideas suggested for improving existing products or services where higher than the ideas suggested to generate completely new products or services.

During the interviews, organizations where asked about problems they faced during the innovation process. Common answers (summation from all companies) are congruent to the literature on innovation; that they refer to different levels such as governmental level, organizational level and individual level. On the governmental level organizations stated that European restrictions and environmental aspects do have an impact on the room of maneuver for radical innovations. On organizational level, the structure of the organization is seen as a major problem for the companies. Moreover, there is often a lack of time, money and especially knowledge for radical innovations. Additionally, frequent interactions with customers and frequent changing demands are highlighted as a problem in the innovation process. Finally, the individual level deals with people who have to be convinced of changes in products and processes and the requirement for a more entrepreneurial attitude.

The reasoning in the course of the paper states that two different configurations of HC an OSC which are sub dimensions of the intellectual capital concept can be related to different types of innovation. To recollect the arguments, it was claimed that specialist HC and cooperative OSC can be linked to incremental innovation while generalist HC and entrepreneurial OSC are associated with radical innovation. Human capital consists of skills, knowledge, attitudes and intellectual agility and organizational social capital contains associability, trust and the configuration of relationships.

When talking about human capital during the interviews, most of the HR directors denoted that they have a clear picture of what skills and knowledge are available and also what skills and knowledge are necessary to come up future demands. The improvement of HC in order to meet future market demands is seen as a constant matter by all participants.

The skill and knowledge profile was judged to be dependent on the type of department employees were working in but on general, the average employee of both sectors was described as being equipped with more general skills and knowledge. Employees from the industrial sector where found to be more generally and broad educated in comparison to the service sector. The existence of employees
with highly specific skills was also recognized but to a very small extent. For instance one participant said:

“We have a small number of people with very special skills. If they leave, we are in trouble”.

When talking about employees attitudes, a frequently mention phenomenon during the interviews was that the small number of specialists are seen to have an error avoiding attitude. One respondent indicated: “They have a tendency to make everything perfect”. This was sometimes seen as a drawback in matters of time which is in line with what Kang & Snell (2009) state. According to them, specialist may be attributed with an error avoiding attitude. Questionnaire data showed that there were slight differences according to the sectors with the industrial sector scoring lower on risk avoidance than the service sector. But still, there is neither a dramatic tendency towards risk avoidance nor a tendency towards a risk embracing attitude since both sector scores on error avoidance are around the mean and slightly negative on error embracing.

Whereas again the interviews showed that team-work and project orientation are a fundamental part of the organizations, the questionnaire data did not support this claim. Respondents from the industrial companies gave overall neutral responses on team work orientation and the service sector was found to be slightly higher than neutral. According to the attitude of sharing knowledge a clear positive picture was found. Both segments showed a very positive knowledge sharing attitude with the industrial segment scoring higher that the service segment.

According to organizational social capital, all directors indicated that inside relationships between employees are seen as very important. While speaking about organizational social capital, it was obvious that HR directors did not just talk about inside but also about outside relationships. Both are seen as equally important for the overall performance of the organization. Especially cooperation with other institutes like universities or other business partners were recognized as a tool for knowledge creation and sharing. Whereas HR directors indicated that they have to constantly improve HC, the improvement of relationships was seen as important but there was not a dramatic need to improve them. Building relationships was stimulated in all organizations rather than stifled. Based on the findings from the interviews and questionnaire it is somewhat difficult to give clear detailed findings on OSC. With respect to associability, it was indicated that a rule following culture was not to be found in all of them except one company. The other companies were found to collectively agree on goals even if the response is not very positive. There were no differences according to the sectors. A slight tendency towards a more tightly coupled system with strong ties and dense networks in contrast to weak and non-redundant relational networks was noted. Trust was found difficult to be judged by the respondents because trust is hard to be measured in a subjective way. There was an obvious lack of consensus what trust really is also after the explanation of our definition. Trust was frequently associated with the satisfaction of employees. Being aware of that, one has to be careful in interpreting the results that resilient trust was found to be more present than generalized trust. The service sector scored in both tightly coupled systems and resilient trust higher that the service sector.
To summarize the findings of human capital and organizational social capital it is difficult to give a clear picture of whether there is a definite tendency for more generalist or specialist HC. The same applies to the concepts of cooperative OSC versus entrepreneurial OSC. We found that companies overall indicate positive scores on broad skills and knowledge, a knowledge sharing attitude, intellectual agility and more neutral responses at team work orientation and error embracing attitudes. This can be interpreted as being more align with generalist human capital than specialist human capital. The picture on organizational social capital is even more confusing in that both aspects of entrepreneurial OSC (resilient trust and collectively agreed goals) and cooperative OSC (tightly coupled relations) could be found. To make it even more complex, the configurations also varied between the two sectors.

Knowledge management activities were present in all the companies and were considered as valuable activities. But considering two sectors of companies and different features of knowledge creation such as experience, learning and teamwork we can see certain trends there. In both sectors creation of knowledge was an established practice. However there were found that special tactics designed for promoting new idea suggestions (e.g. idea boxes) was higher in industrial sector. Nevertheless, firm-specific experience as well as learning environment for new knowledge generation was higher at service sector.

Mostly knowledge management activities were linked to knowledge transfer activities. Often knowledge creation process was connected to teamwork and learning. In certain cases teams were used for the purpose of refining or creating new knowledge. Here teams were formed when an existing product/process was needed to improve or new product/process was going to be invented. However, in other companies teams were formed for different purposes. They were linked to projects; hence, in these cases teams were created automatically since a group of employees were assigned to a certain project. Overall, formal meetings and cross-functional teams were frequently utilized in both sectors to brainstorm together in order to develop new ideas or work on problem solving issues.

Most of the companies in both sectors linked knowledge creation and transfer to the training process. We will elaborate later about the types of trainings used in most of the companies. Some companies mentioned about the importance of flexibility, autonomy, involvement and empowerment of employees to explore themselves and learn from each other.

On general level knowledge acquisition is present in the companies from both sectors. However, acquiring knowledge from external sources seems to be stronger rather than from internal sources. For instance, it was obvious that customer relationships are stronger compared to the attempts from the organization to find out true feelings of employees towards their jobs. One respondent mentioned:

“We all become more business oriented. Also the possibility that you can keep people forever on specific creative jobs … that’s not real any more”.

It is worth mentioning that industrial sector places more focus on external sources rather than service sector, such as relationships with customers and market research (obtaining information about competitors is higher in service sector).
Knowledge sharing activities are quite well established in most of the companies. However, the findings don’t show the clear dominance of either personalization or codification strategy within companies, though we can still see some trends in sectors. For instance, in service sector knowledge dissemination is higher than in industrial sector. Further, personalization strategy is more highly utilized in service sector. For storing codified knowledge most of them used databases, intranet, knowledge repositories and written documents. For the personalization strategy mostly were mentioned meetings, informal knowledge sharing tactics, face-to-face communication and coaching or mentoring. In addition, most of them used ICT tools to ensure personalization strategy, such as e-mails and telephones, though extra-net was rarely used to share knowledge outside of the company. But meetings designed for reflection and sharing knowledge and experience with external agents are higher in industrial sector. We can assume that communication with external knowledge sources is based more on personalization strategy in this sector.

Mostly the speed of responding to knowledge requirements is quite high in most of the companies. However, it’s interesting to note that responding to customer needs rather than meeting employee concerns is more rapidly implemented in industrial sector. This notion goes in line with earlier finding that knowledge from external sources is more actively acquired rather than from internal sources. Higher is the level of responding to technological developments in service sector. In addition, we’ve mentioned that acquisition of competitor information is higher in service sector. It is interesting to note that responding to this information rapidly is higher as well in the same sector compared to industrial sector.

When talking about HR-practices we found that some of them were not either explicit or formalized. For instance, mostly job rotation and reward systems were not formalized in companies. In most of the companies there were no explicit HR practices that served solely for promoting innovation. Participants mentioned that certain practices along with their primary goal might carry the purpose to stimulate innovation such as: training and job rotation. The need for additional HR practices or improvement of existing ones varied between companies. It was frequently mentioned that there was a necessity for management training for line managers since they were the implementers of HR policies.

In certain cases job rotation was interchangeably used for teamwork, involvement in projects or developmental programs, such as traineeships where employees move from one position to another during several years. On our question whether job rotation was present in the company one of our respondents replied:

“Yes, for sure; we have several project teams working on different projects. It is not always the same in group. It depends on the market, on the customer questions, on the level of qualifications and on the level of capabilities”.

So since different employees were involved in project teamwork and worked on different issues this practice was resembled with job rotation. Another respondent stated:
“We do a lot of job rotation because our process from year to year is very different. We don’t make products over the years the same. When one project is over everybody has to do something else”.

However, it’s worth mentioning that questionnaire findings showed that job rotation indicators in most of the companies were quite low both between different areas of specialization and within one area of specialization. However, there is a tendency that job rotation is more established in the industrial sector than in the service sector.

Another practice mentioned to be important for innovation is training. It was striking to find out that in both sectors training focused on improving existing job related skills were dramatically higher than training designed to prepare employees beyond their existing job requirements. Both types of training were found to be more established in the industrial sector. Training was also more based on interdisciplinary teams and therefore more heterogeneous than homogeneous. However, there was no preference for either kind of training configuration in the industrial sectors whereas the preference was towards heterogeneous training for the service sector. In most of the companies on-the-job training and mentoring were common practices. However it’s notable that in service sector it was a widely more established practice in contrast to the industrial sector.

Performance appraisals focused on evaluating results of the performance was clearly higher than evaluation of the process. Nevertheless, both types of appraisal (evaluating result and process) were more introduced in the service sector. However, it’s also interesting to see that errors are not tolerated during evaluations in most of the companies. This is in line with what some of the companies mentioned during interviews about the problems in innovation, that the attitude is mostly 100% preciseness. One respondent stated about this issue:

“The problems with engineers is that everything needs to be 100%, anything less is not good enough…sometimes I think 100% is only good enough, but it blocks certain developments, because sometimes you can only achieve improvements through trial and error process”.

One clear difference between the sectors was found that toleration of errors was more established in service sector than in the industrial sector. There is a high preference for organizations from both sectors to appraise individuals in comparison to groups. According to the preference of short-term versus long-term appraisal there was only found a preference towards long term appraisal in the industrial sector whereas no preference for either type was found in the service sector. In addition, it was revealed that peers were not frequently involved in performance appraisals in either of the sectors. However, it was more used in the service sector.

4. DISCUSSION AND CONCLUSION

4.1 Discussion
The aim of our research was to investigated the relationship of both intellectual capital and knowledge management with different types of innovation (radical and incremental) and what types of HRM practices can be related to develop IC and KM in order to facilitate radical and incremental innovation? Before answering the
research questions, the main findings of this research will be discussed. After this, a short summary will strive to answer the main research question.

During the investigation certain findings can be used to explain why it is difficult to make clear relationships between these different concepts. First of all, not all companies had an innovative strategy which might imply that not all of the companies really intend to achieve it or see it as the primary goal of their organization. HR managers were often found not to be really aware of the concept of innovation and also had no priority on certain types of innovation. Contradictory, all except one participant stated that innovation is important for them and that their innovative performance is good. That may imply that HR is not yet strategically aligned to innovation and may still have a more administrative role. The fact that there is no strategic alignment to innovation and also no priority for one certain type of innovation puts this research in a position where it is difficult to relate certain configurations or practices to certain types of innovation.

According to the relationship between HC and innovation it is difficult to indicate a clear relationship since we found generalist human capital and incremental innovation to be present in the majority. This is contradictory to earlier mentioned research of Kang & Snell (2009) and Hall & Soskice (2004) which related more broad skills and knowledge to exploration and specific skills and knowledge to exploitation. However, within the concept of generalist HC research findings did not support all aspects of the sub-parts of generalist human capital. Basically, broad skills and knowledge, a knowledge sharing attitude and intellectual agility could be found in all of the companies but team work orientation and error embracing attitudes could not found to be very high. Therefore, even if there are more arguments for saying that there is a tendency to have generalist HC, the picture is not that clear. Whereas studies on the relationship between HRM and innovation emphasize the importance of team work and allowing employees to make mistakes (Laursen & Foss, 2003; Jiménez- Jiménez & Sanz-Valle, 2008) team work and error embracing attitudes where not found to be quite neutral. Nevertheless, since knowledge sharing is seen as an important prerequisite for innovation (Shipton, 2006), the positive scores on the knowledge sharing attitude are clearly a positive finding with regard to innovation.

For organizational capital, no support could be found for more cooperative OSC or entrepreneurial OSC. It is not even possible to state a clear tendency here. Whereas the finding that there organizations have more tightly coupled systems with strong ties and networks (cooperative OSC) between employees can be easily related to incremental innovation in this study, we did not find indicators for generalized trust and a rule following culture (also parts of cooperative OSC). Therefore, only one part of the cooperative OSC configuration aligns with the majority of incremental innovation found. Notably, it was argued that goals which are collectively agreed are a part of entrepreneurial OSC which can be related to radical innovation. In this study, we found a tendency towards more collectively agreed goals in comparison to the reliance on formal rules or a more rule following culture. It could be argued that collectively agreed goals and action may be more a part of cooperative OSC which could be more related to incremental innovation. This would be more in line with the theory from Hall & Soskice (2004) who argue that collective decision making processes may take a long time and great effort which could hinder radical breakthrough.
In summary, we found a tendency towards more generalist human capital and no clear picture on a definite configuration of organizational social capital. The fact that on general more incremental innovation and general HC was found to be present challenges the proposed relationships in the theoretical part.

As discussed above general finding about human capital was that mostly employees were equipped with general skills, especially in industrial sector. However, incremental innovation was higher in both sectors. This is a contradictory finding for us, since we were claiming the relationship in contrasting way. To state in opposite way, it means that mostly general skills exist in the context of incremental innovation. If we base our argument on this finding we can claim that specialist skills are not contributors to incremental innovation. Further, since we connected single-loop learning with specialist skill holders it can be argued that the first is not a contributor to incremental innovation either. However, there is one clear finding that goes to our conceptualization, that firm-specific experience can be beneficial for incremental innovation. This finding is even more strengthened at service sector.

Brainstorming on new ideas in teams, or trying new ideas without knowing consequences (risk taking attitude) and contribution to lack of shared experience was law. This means that input from various experiences is not established. This finding opens one logic – we saw that radical innovation was less introduced in either of the sectors, this goes in line with the assumptions and findings in the theoretical part that absence of mentioned practices can hinder radical innovation (Gupta & Singhal, 1993; Majchrzak, Cooper & Neece, 2004).

On general we can say that learning environment promoting new idea generation was high in both sectors. At the same time, we’ve already seen that general skills are also dominant in both sectors. This implies to the fact that double-loop learning can be characteristic to generalist human capital but this might not contribute to radical innovation. In terms of sectors, it’s difficult to group findings there for the interest of this research. We see that in service sector learning environment for new idea generation is much higher than in industrial sector, however generalist human capital is more established in industrial sector.

Regarding knowledge dissemination, we can see a clear trend that in service sector both types of strategies are more introduced rather than in industrial sector. However, personalization strategy dominates compared to codification strategy. What is the value of this finding? In theoretical constructs we’ve connected personalization strategy with radical innovation. However empirical part shows that it is not very much linked to that. We clearly see that storytelling, best practices and/or lessons learned collection and diffusion is quite high in services sector. These practices was conceptualized to be contributory to radical innovation, however findings show that they support incremental innovation.

As we saw knowledge creation and dissemination instruments are established in both sectors. The rest KM channels – acquisition and responsiveness are also well introduced. Going back to our general finding, we can state that KM channels are present in both sectors; however their outcomes are not always matching theoretical findings.
The use of job rotation as an HR practice is very low and there is no clear distinction between the two types whether employees are rotated between different areas of specialization or within one area of specialization. Hence we cannot argue anything in relation to the different IC and KM configurations. Job rotation seems to be one of the biggest challenges for organizations.

With regard to training we have a clear distinction but no clear relationships to the different configurations of KM, IC and different types of innovation. There is a clear tendency for specific training for improving existing skills rather than skills beyond their existing job requirements. Earlier we’ve stated about the contradictory finding that single-loop learning and specialist human capital were low but incremental innovation was high. The existence of trainings enhancing specialist human capital says that companies may be trying to foster specialist human capital and single-loop learning. Whether this is on purpose stays unknown. Another finding about types of trainings is that more heterogeneous trainings are encouraged in companies. This can be related to the fact that generalist human capital is dominant in the companies. However, this synergy doesn’t theoretically foster radical innovation.

Research data showed that personalization strategy and tightly coupled systems were dominant factors. Hence, we can assume that a KM channel may be a supporter of some configurations of social capital. Where people exchange knowledge on a face to face basis their relationships and ties may become more strong and dense. Further, the findings showed that mentoring was an established practice on a moderate level. Hence, this HR practice can be understood as a stimulator of KM and IC configurations.

According to performance appraisal there is no clear picture on the relationships between different types of appraisal, configurations of IC, KM and innovation. We found that result based appraisal was preferred in contrast to process appraisal. Result based appraisal is a practice which is theoretically linked to the development of more generalist human capital, double loop learning and in turn to radical innovation. Empirically we found that there may be the above mentioned relationship between result based appraisal and generalist human capital and double loop learning but the final link to radical innovation cannot be established. Further, error avoidance appraisal was found to be more used than error embracing appraisal. This implies to the fact that error avoidance appraisal may be directly linked to incremental innovation and not through generalist human capital and double loop learning. The same may apply to individual appraisal which is found to be more present in contrast to group based appraisal. Individual appraisal was argued to develop single loop learning and specialist human capital. Since neither of the concepts is present to high extent we can argue that individual appraisal may have a direct effect on incremental innovation. In contrast to claims of direct relationships, appraisal with long term objectives was argued to develop generalist HC and double loop learning and in turn lead to radical innovation. Empirically, we found that this type of appraisal can be related to the development of generalist human capital and double loop learning but not to the radical innovation since more incremental innovation was present.

These findings clearly show that not all argued relationships can be supported. To give a better overview, Table 2 shows some of the actual findings of our research.
Table 2: Empirically found relationships

<table>
<thead>
<tr>
<th>Human Resource Practices</th>
<th>Knowledge management &amp; Intellectual capital</th>
<th>Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Heterogeneous Training</td>
<td>• Generalist HC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Double loop learning</td>
<td></td>
</tr>
<tr>
<td>• Result based appraisal</td>
<td>• Generalist HC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Double loop learning</td>
<td></td>
</tr>
<tr>
<td>• Error avoiding appraisal</td>
<td>• Generalist HC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Double loop learning</td>
<td></td>
</tr>
<tr>
<td>• Individual appraisal</td>
<td></td>
<td>• Incremental innovation</td>
</tr>
<tr>
<td>• Long term appraisal</td>
<td>• Generalist HC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Double loop learning</td>
<td></td>
</tr>
</tbody>
</table>

4.2 Limitations
First of all, we should mention that a small sample of companies makes it difficult to make generalizations for a larger sample. Besides, the selected sample didn’t have a clear priority for either types of innovation. That caused difficulty to relate our theoretical arguments since it was designed to find links with different types of innovation. In addition, it’s difficult to make causal relationships since the study was investigated at one time point. Another limitation of the study that should be mentioned is that sometimes interview findings contradicted questionnaire results. For example, one respondent stated that they do not actually have radical innovation whereas the questionnaire indicated radical innovation. This fact made some results ambiguous and therefore results especially according to innovation should be interpreted carefully. These limitations call for further investigations with another design. Since different aspects for instance organizational social capital and innovation where difficult to measure, future research should focus on more quantitative assessment of these concepts. But as the literature on innovation shows, this is a topic on its own since researchers are working for years to find an appropriate instrument to measure innovation.

4.3 Conclusion
Recent literature on organizational studies highlights the necessity for organizations to innovate in order to achieve a competitive edge. This study aimed at contributing to these studies in that it integrated two newly raised concepts of intellectual capital and knowledge management in the relationship between human resource management and innovation. So far we know this study is the first one which aims at this integration. Based on the findings we saw that IC and KM configurations are frequently related to each other and also with different types of innovation. Besides, as we saw HR practices were sometimes interchangeably used with IC and KM concepts. This raises a question whether HR practices have similar connotation as IC and KM concepts do.

In addition, HR practices in certain cases have a direct affect on innovation rather than via IC and KM structures. This makes it difficult for now to state whether KM and IC can play a mediating or moderating role in the relationship between HRM and
innovation. However, since this is a first attempt, future studies should probably focus especially on intellectual capital or knowledge management in order to become a more focused picture. The fact that we found interrelations between KM and IC makes it difficult to state which results can be attributed to which concept. Even thought we saw the link between KM and IC it was complex to relate this relationship to different types of innovation, further, considering the impact of different HR practices. For further research, there should be a focus on a certain part of this research model since this model may be too complex for single investigation.

REFERENCES


APPENDIX

Table 3: Theoretical configurations of intellectual capital

<table>
<thead>
<tr>
<th>Human Capital</th>
<th>Generalist</th>
<th>Specialist</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Skills</td>
<td>Multi-skilled, versatile repertoire of capabilities which can be used across domains.</td>
<td>Deep, localized and embedded knowledge in one particular knowledge domain.</td>
</tr>
<tr>
<td>• Knowledge</td>
<td>General knowledge; focus on gaining knowledge outside a firm’s current knowledge domain.</td>
<td>Specialized, in depth knowledge; focus on refining and deepening a firm’s current knowledge stock.</td>
</tr>
<tr>
<td>• Attitudes</td>
<td>Knowledge sharing attitude. “Error embracing” attitude</td>
<td>Reluctant to share knowledge. “Error avoiding” attitude.</td>
</tr>
<tr>
<td>• Intellectual agility</td>
<td>High necessary to combine different external sources of information for successful generation of new ideas.</td>
<td>Combination of different internal sources of information is important for successful generation of new ideas. Specialists may be less likely to master knowledge across different domains than generalists.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organizational social capital</th>
<th>Entrepreneurial relational</th>
<th>Cooperative relational</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Associability</td>
<td>Reliance on collectively agreed goals and actions.</td>
<td>More reliance on formal rules instead of collectively agreed goals and actions.</td>
</tr>
<tr>
<td>• Trust</td>
<td>Resilient dyadic trust through direct personal experience. Opportunity and autonomy to organize both the way work is organized and done.</td>
<td>Generalized or institutional trust based on membership. Rule following culture or strict reliance on formal rules which reinforces</td>
</tr>
<tr>
<td>Configuration of relationships</td>
<td>Weak and non redundant relational networks may have the disadvantage of developing no new and diverse relationships.</td>
<td>Efficient coordination. Strong and dense network connections.</td>
</tr>
</tbody>
</table>