UNIVERSITY OF TWENTE

KNOWLEDGE MANAGEMENT, HR PRACTICES AND INNOVATION

Theoretical and empirical exploration

Tamar Jinchveladze (s0211516)

2009

Supervisors: Dr. Martijn van Velzen

Prof. Dr. Jan Kees Looise

Master of Business Administration
Specialization – Human Resource Management

Acknowledgments

It is a pleasure to thank those who made this thesis possible. I would like to show my utmost gratitude to Dr. Martijn van Velzen and Prof. Dr. Jan Kees Looise for supervising my work. Their feedback and support was utterly valuable. I always felt inspired after every meeting and discussion. This research would not have been possible without their constructive insights and encouragement.

I owe my deepest gratitude to Mrs. Antonia de Winter-Gerus for granting me a scholarship in order to accomplish my Master program at the University of Twente. Without her financial assistance I would not have been able to undertake this academic endeavor.

I would like to thank Prof.Dr.Ir. J.J. Krabbendam for giving me the opportunity of traineeship at the faculty of Management and Governance at the University of Twente. This possibility facilitated the successful accomplishment of this research.

My further gratitude goes to Andre Veenendaal who was very helpful and always willing to provide support in order to make this research possible.

Finally, I would like to thank my fellow students, especially Felix Zschockelt for his wonderful teamwork abilities and collaboration during the research.

TABLE OF CONTENT

Abstract:

This research, as far as known, provides a first attempt to explore the role of knowledge management (KM) in an integrative way between the relationship of human resource (HR) practices and innovation. Moreover, three sub-components of knowledge creation (experience, learning and teamwork) and two segments of knowledge transfer (codification and personalization) are related to the exploitative and explorative innovation. Alongside, four HR practices have been selected to check their affect on KM channels, such as performance appraisal, job rotation, training/mentoring and reward systems. Further, organizational structure and social capital are explored as pre-conditions for above mentioned relationships.

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 eight companies from industrial and service sector in the region of Twente, the Netherlands. The respondents held high positions in HR departments, mostly as directors or managers. The findings showed that there was a lack of clear strategy on innovation. Exploitative innovation was dominant in companies. Some sub-components of KM channels were related to exploitative innovation or were mostly used interchangeably with HR practices. Overall, the research opens a number of questions that can be an arena for further research.

1. INTORDUCTION

"If money is your hope for independence you will never have it.
The only real security that a man will have in this world
is a reserve of knowledge, experience, and ability".
Henry Ford

In accordance with the evolution of mankind every aspect of lifecycle transforms with time. Natural tendency of the human being is to get better and to progress. Similarly the institutions within the organizations develop to meet the global tendencies. After the cold war and the breakup of the Soviet Union new market opportunities emerged. Development of informational technologies, changing demands of customers and suppliers affected the process of production and competitive environment. In response, new management tools have been developed, team-work was emphasized and multi skilled labor played a crucial role in sustaining competitive advantage (Harrison & Kessles, 2004). Reinventing the wheel leads to waste of time and resources. Thus, superiority of knowledge management (KM) received utmost attention and importance during this globalization driven tendencies (Hislop, 2002). Mostly, it is accepted that KM is concerned with knowledge building, renewal, transfer and application in order to facilitate achieving competitive advantage (Bhatt, 2000; Demarest, 1997; McCampbell, Clare & Gitters, 1999; Soliman & Spooner, 2000; Wiig, 1997). Researchers connect KM with innovation and even name it as an *antecedent of innovation* (Darroch & McNaughton, 2002). In addition, many argue that knowledge management is about people, not technology (Soliman & Spooner, 2000). KM with its implication to human resources places a great challenge to the management of innovation (Scarbrough, 2003). Hence, my focus in this research will be on the ways KM is affected by HR practices and how this relationship can support innovation in the company.

Recent trends of globalization and a rapid development of information technologies oblige organizations to fit the global environment. The financial crisis bursting in 2007 intensified the tension between maintaining status quo and advancement. Many unwanted outcomes were caused, such as a decrease in trade and industrial production, unemployment, insecurity of financial markets and political instability. There were concerns in innovative companies as well. It is now an additional assignment for them, to struggle with the crisis and at the same time keep their advantages ahead in the market. Depending on the company position various strategies have been prioritized, some preferred teaming up with outsiders to share costs, some kept shifting jobs to low cost countries, some even increased employees in R&D section. However, during the recession a number of innovative companies stepped back in ranking system trying to overcome financial downturns1.

[1] http://www.businessweek.com/magazine/content/09_16/b4127046252968.htm

Numerous questions were raised on maintaining the position in the market, such as: should the company change the management policies? What is the best way of leveraging resources during the recession? It is an additional challenge for innovative companies to sustain the market share and introduce new products/processes or improve the existing ones as well when the global economy suffers with the crisis. Many companies saved expenses by stopping recruitment procedures. But how can be fresh minds sourced in the company then? How to support creation of new ideas? One logical answer that comes to the mind apparently is to utilize and develop the existing resources in an efficient and effective way, create new knowledge by smart tuning of existing tools. The notion of ***absorptive learning*** lies on the principle to use the knowledge that resides in employees and absorb it within organizational routines (Kamoche & Mueller, 1998). Innovation is also seen as "the integration of knowledge with action" (Scarbrough, 2003, p.505), in other words, putting existing talent into practice. Many companies struggle with that. Most valuable knowledge for the company is the one accumulated during the years and know-how resided in the minds of employees. "The role of knowledge which resides in individuals should be a central concern in international business" states Kamoche (1997, p.222).

Research identified types and categories of innovation, among those are technical and administrative, modular and architectural, product and process, radical and incremental innovations (Benner & Tushman, 2003; Koberg, Detienne & Heppard, 2003; O'Reilly & Tushman, 2004; Subramanian & Nilakanta, 1996). However, most researchers agree to categorize innovation among four pillars: process vs. product and radical vs. incremental (or explorative vs. exploitative). But what types of innovation can be supported and to what extent? The link between KM and innovation has been investigated by many authors (Carneiro, 2000; Cavusgil, Calantone & Zhao, 2003; Chen & Huang, 2007; Leonard & Sensiper, 1998; Popadiuk & Choo, 2006; Ruggles & Little, 1997). Even the role of KM as a mediator between HRM and innovation has been explored (Chen & Huang, 2007). However, there still is a lack of understanding regarding the type of KM processes that are important for different forms of innovation. Researchers admit that knowledge creation has important implications for innovativeness (Krogh, Ichijo and Nonaka, 2000; Lee & Choi, 2003; Popadiuk and Choo, 2006; Ruggles and Little, 1997). However, no research has been found linking the specific KM processes to certain types of innovation such as explorative and exploitative. The article by Kang and Snell (2009) describes specific links between intellectual capital, HRM and explorative and exploitative innovation. However, they propose theoretical assumptions without empirical investigation.

This research as known is first to take a further step and find links between certain components of knowledge management and specific types of innovation. In this study knowledge management channels (knowledge creation, acquisition, transfer and responsiveness) will be linked with two types

of innovation (exploitative and explorative). Moreover, specific sub-components of KM channels will be related to different types of innovation.

Since innovation arises at the intersection of people flow and knowledge flow (Scarbrough, 2003) the main goal of this research is to investigate the ways innovation can become a result of knowledge management with the help of appropriate human resource (HR) practices. There are a number of analyses linking HR practices and knowledge management (Currie & Kerring, 2003; Hislop, 2003; Kamoche, 1997; Oltra, 2005; Robertson & Hammersley, 2000; Soliman & Spooner, 2000; Yahya & Goh, 2002). HR practices can play a crucial role by either supporting or hindering knowledge creation and transfer. Without the human factor knowledge cannot be created, utilized or put into action. Hence, it is a cohesive process during which innovation emerges. Since different sets of practices are suited for different firm strategies (Delery & Doty, 1996) it is interesting to investigate specifically which practices can contribute to knowledge management. For the relevance of this study HRM strategies contributing to KM and innovation are selected. Gupta and Singhal (1993) identified four dimensions of HRM strategies fostering creativity and innovation. They are: human resources planning, performance appraisal, reward systems and career management. Based on these strategies four HR practices will be analyzed (performance appraisal, reward systems, training/mentoring and job rotation). Further, specific categories of these HR practices will be linked with the sub-components of KM channels. At the end, the whole picture will show how HR practices can contribute to specific KM activities which can lead to a certain type of innovation.

To bring light to the uniqueness and specificity of this study I will bring one example. For instance, if performance appraisal is based on evaluating the outcomes of performance it can be argued that this will facilitate knowledge creation and sharing which can contribute to explorative innovation. Likewise, if error-avoiding, process oriented appraisals are introduced it can contribute to knowledge creation in a way that it can consequently encourage exploitative innovation. Structuring HR practices for contradictory projects in different ways and promoting knowledge management is not an easy task. It will be argued that certain pre-conditions will have an effect on this relationship such as organization structure and social capital.

In brief, this research will try to form the link from HR practices to KM and from KM to innovation. Nevertheless, the direct link between HR practices and types of innovation can be identified as well; however my assumption is that this link can be even stronger through the KM factor. Hence, the central question of my research is as follows:

How can HR practices facilitate knowledge management that can enhance both explorative and exploitative innovation?

The following sub-questions can be derived from the central question:

What is the definition of knowledge management?

What is innovation?

How can knowledge management activities lead to different types of innovation?

How can certain HR practices contribute to these knowledge management activities?

What pre-conditions are necessary to contribute to the relationship between HR practices, KM and innovation?

What methodology can be used to measure HR practices, KM processes and types of innovation?

2. LITERATURE REVIEW

2.1 Definition of knowledge management

Before defining knowledge management it is important to know what knowledge means and how various authors perceive it. Davenport and Prusak (2000) define knowledge as:

> …a fluid mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experience and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories, but also in organizational routines, processes, practices and norms (knowledge section, para. 3).

Knowledge is often differentiated from data and information with the notion that it carries meaning; it can be obtained from individuals, organization routines, personal contacts, conversations or apprenticeships (Davenport & Prusak, 2000). Some define data and information as two of the six components of knowledge, other parts include wisdom, understanding, facts and phenomena (Bellaver & Lusa, 2002).

Barney (1991) classifies knowledge into two categories – unique, owned by the specific firm and public, owned by several competitors. They state that in order to achieve competitive advantage unique knowledge should be valuable, difficult for competitors to imitate and difficult to substitute.

Lam (1998) defined knowledge on two dimensions: epistemological (tacit vs. explicit) and ontological (individual vs. collective). These two dimensions create four categories of knowledge: *embrained*, *embodied*, *encoded*, and *embedded* knowledge.

Scarbrough (2003) summarized the classification of knowledge into four broad categories: "(1) know what (declarative or explicit knowledge); (2) know how (procedural or tacit knowledge); (3) know who (knowledge of individuals); and (4) know why (understanding of the context)" (p. 507/8)

Bhatt (2001) uses foreground and background knowledge, the first could be considered as explicit and the latter as tacit knowledge. However, he argues that only background knowledge is not a determinant of the success of the organization rather than its *symbiotic* relationship with foreground knowledge. To put this in different words, it is obvious that brining background knowledge into foreground is similar to transformation of tacit into explicit and this process can be pre-action for new knowledge generation, the author supports this statement saying that "by reconfiguring and

recombining foreground and background knowledge through different sets of interactions, an organization can create new realities and meanings" (p. 71).

Four discrete notions of knowledge by Harrison and Kessels (2004) help realize it from different angles and understand its meaning to the organization. *Knowledge as control* is identified as an engine that enables the machine to be controlled. It refers to the notion that formal rules and procedures, defined roles and tasks are crucial for controlling organizational processes. This goes in line with the perception of knowledge by Davenport and Prusak (2000) when stating that it can be embedded in the norms and routines of the organization. *Knowledge as intelligence* defines organization as a brain where knowledge is considered as intelligence that enables it to make informed decisions and solve problems while considering competitive environment, organizations need to develop a capacity over time in order to deal with turbulent environment. *Knowledge as relationships* identifies knowledge shaped by interactions in the organization. They define an organization as a social system and pose questions of how much knowledge should be shared and how easy it is to communicate tacit knowledge. *Knowledge as commodity* defines knowledge that is buried in people and that can be extracted and utilized. It emphases the importance of tacit knowledge which is a core competence of the organization and can largely support company's competitive position in the market. However, it is very difficult to share the tacit knowledge which might not even be clear for the person who owns it.

In most of the classifications mentioned above tacit knowledge is implied as important determinant of what knowledge is about. Knowledge as commodity, dispositional, unique, epistemological, know-how is all those words that refer to tacit knowledge. This notion has been first articulated by Polanyi (1962). His finding was based on the assumption that "we know more than we can tell" (p.601). Tacit knowledge is a true reality that is embedded in our minds, how we perceive the world, intuitive information, subjective insights, emotions, values, symbols. Tacit knowledge is subjective, personal while explicit is objective; tacit is the knowledge of experience of body while explicit is of mind. It is hard to transmit in words and share with others (Nonaka & Takeuchi, 1995). There are two types of unknown (tacit) knowledge: "knowledge that you do not know you have and knowledge that you do not know you don't have" (Stewart, 1997, p. 4). Hence, if we don't know what we own how is it possible to share it? The answer can be found in the definition of knowledge management.

Tacit knowledge prevents organizations from imitation, especially social tacit knowledge which is owned by the company (Krogh, Ichijo & Nonaka, 2000). The cited authors listed five steps for new knowledge creation: sharing tacit knowledge, creating concepts, justifying concepts, building a prototype and cross-leveling knowledge. According to them naming and categorization is important for conversion of tacit into explicit knowledge. They argue that for tacit knowledge physical proximity is essential since the personal experience, senses and bodily movement should be passed on. Hence,

language is not the mechanism of transferring knowledge. The authors state specific ways how to share tacit knowledge: direct observation, direct observation & narration, imitation, experimentation & comparison and joint execution[2]. These steps resemble Nonaka and Takeuchi's (1995) modes of knowledge conversion.

Some authors even argue that organizational knowledge is basically tacitly owned (Hislop, 2002; Lam, 2000). In other words, it is a firm-specific knowledge that is accumulated in the minds of employees not clearly realizing that they own it. It can be the experience gained during the years of service in the organization. On the other hand, some argue that any kind of knowledge carries tacit dimension (Quintas, Lefrere & Jones, 1997).

Hansen (1999) classified knowledge management strategies into two categories: codification and personalization strategies. The first refers to the strategy where knowledge is mostly stored in computers, databases and can be easily accessible by employees. The latter is mostly based on person-to-person communication. Companies applying this strategy use computers to facilitate communication of knowledge between people, not storing it.

Knowledge has also been categorized based on its value and uniqueness (Lopez-Cabrales, Perez-Luno & Cabrera, 2009). According to authors, valuable knowledge refers to its ability to increase efficiency and effectiveness of the firm. Unique knowledge means that a person is equipped with irreplaceable and firm-specific knowledge, which is difficult for competitors to imitate.

As it was concluded tacit knowledge appeared to be an inseparable part of the notion of knowledge. Talking about organizational tacit knowledge most authors resemble it to the bottom of the iceberg (Herrgard, 2000). Thus, it's a hidden capacity, difficult to transmit, but it carries utmost importance for the successful performance of the organization. It has been argued that the core competence of the organization relies on not only knowing *what to do* but also *how to do*. "One can learn the importance

[2] "*Direct observation*: micro-community members observe the task at hand and the skills of others in solving this task, as in a master-apprentice relationship. Observers come to share beliefs about which actions work and which do not. They thereby increase their potential to act in similar situations. *Direct observation and narration*: members observe the task at hand and get additional explanations from other members about the process of solving the task, often in the form of a narrative about similar incidents or a metaphor. The beliefs of observers are further shaped by these stories. *Imitation:* members attempt to imitate a task based on direct observation of others. *Experimentation and comparison:* members try out various solutions and then observe an expert at work, comparing their own performance to the expert's. *Joint execution:* community members jointly try to solve the task and the more experienced offer small hints and ideas about how to improve the performance of the less experienced" (Krogh et al, 2000, p.83).

of service quality by reading textbooks but not learn a 'smiling attitude' by reading about it" (Herrgard, 2000, p.359).

But the question is how to transmit that firm-specific experience that is tacitly owned by an employee or groups of employees. How to reveal that golden hidden capacity that might become the driver for the organization's further development and success? The answer to these questions can be partially found in the famous ***modes of the knowledge creation*** or SECI model by Nonaka (1994, p. 19). It vividly depicts how tacit and explicit knowledge are constantly interrelated. He developed four modes of knowledge exchange, first is called ***socialization*** (from tacit to tacit), second is ***externalization*** (from tacit to explicit), third is ***combination*** (from explicit to explicit) and fourth is ***internalization*** (from tacit to explicit). The core and most difficult process is externalization mode. This is one of the channels that help bottom of iceberg come to the surface of water. There are various methods for supporting this process, such as using metaphors, analogies, observations, apprenticeships, face-to-face interactions, practical experience etc. (Herrgard, 2000; Nonaka, 1994). Combination mode facilitates transmission of already converted knowledge while during internalization employees digest explicit knowledge, in other words they learn. Through properties of context employees further transfer internalized knowledge (mode of internalization) while the ones who receive it again engage in the process of learning, the forms can be "learning by doing, training or exercising" (Herrgard, 2000, p.360). This notion leads to another statement – companies who engage in knowledge management activities can be considered as learning organizations or so called knowledge-intensive companies (Darroch & Mcnaughton, 2002). Learning organizations strive at studying from their own experience and mistakes, experimenting new approaches and benchmarking (Bhatt 2000; Davenport & Prusak, 2000; Garvin, 1993; Pfeffer & Sutton, 1999). In the following sections I will relate certain constructs to the SECI mode to make it more vivid how tacit and explicit knowledge can be interrelated producing beneficial outcomes.

To summarize main commonalities of the different knowledge perceptions (***Table I***) by various authors I can claim that knowledge is about subjective insights of people blended with contextual information; it's about ability of expressing tacitly or explicitly. Talking about knowledge of employees from an organizational perspective, different factors can be considered, such as knowledge embedded in technology, norms and rules of the organization, in relationships of employees as well as in external knowledge repositories, such as stakeholders of the organization.

Considering the concept and dimensions of knowledge discussed above, it becomes clear how complex it can become when applying knowledge to organizational settings and managing it. There is not a clear consensus yet what knowledge management is about. Knowledge management has been considered as "a dazzling, multi-faceted, and controversially discussed concept" (Greiner, Bohmann &

Krcmar, 2007). The definitions of KM differ depending on the purpose for which they're intended (Quintas, Lefrere & Jones, 1997). In other words, "KM is a tool to support an organization's strategic plan. This is its purpose" (Dove, 1999, p.30). For the interest of this research KM is defined for the benefit of innovation.

Table I. Dimensions of knowledge.

Authors	**Dimensions and definitions of knowledge or knowledge strategies**
Barney, 1991	Unique vs. public
Bellaver & Lusa, 2002	Data, information, wisdom, understanding, facts and phenomena
Bhatt, 2001	Foreground vs. background knowledge
Davenport & Prusak, 2000	Experience, values, contextual information and expert insight
Hansen, 1999	Codified vs. personalized
Harrison & Kessels, 2004	Control, intelligence, relationships and commodity
Lam, 1998	Epistemological vs. ontological
Lopez-Cabrales, Perez-Luno & Cabrera, 2009	Valuable and unique
Polanyi, 1962	Tacit vs. explicit
Scarbrough, 2003	Know what, know how, know who and know why

First of all, let's discuss initial approaches to KM. It has been used in many ways – as a mechanism of storing information, for instance, using databases and computer programs, but also as a synergy of data/information processing capacity and human being creativity (Civi, 2000). This approach was elaborated more by socio-technical systems' (STS) perspective. By integrating STS in knowledge management made KM multi layered. It integrated technology (hardware and software), organizational context (rules and norms) and background knowledge that employees carry embedded in social relations (Pan & Scarbrough, 1999). Hence, in this way human and technological aspects have been integrated. However, some authors place more emphasis on the importance of human factor for dissemination of knowledge rather than on technology. For instance, it has been argued that managers get two thirds of the information from face-to-face communication (Quintas, Lefrere & Jones, 1997). As I've already mentioned above, information is part of the knowledge. Information can be used to transform it to knowledge.

But why is KM important? It is argued that it helps reduce the loss of intellectual capacity from employees who leave, reduces the cost of developing new products and processes and supports to increase productivity of employees by transferring knowledge to all of the employees (Lim, Ahmed, & Zairi, 1999). 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). For Bellaver and Lusa (2002) "KM is the process of finding, selecting, organizing, distilling, and presenting information in a manner that strategically improves an enterprise's comprehension in many specific areas of interest, from marketing to employee training" (p.xx). In general, KM provides managers with "right knowledge in the right form and quality, and at the right time and place" (Bodrow, 2006, p.46). This part of KM can be understood as its outcome since it is the last stage when knowledge is formed.

KM has been sometimes compared to intellectual capital. Overlaps have been found as well as differences between these two notions. Intellectual capital management (ICM) takes care of overall intellectual assets in the organization from strategic perspectives, while KM carries more "tactical and operational perspectives" (Wiig, 1997, p.400). KM can also be considered as a prerequisite for ICM, successful KM implementation should lead to better ICM. KM has also been defined as a tool to generate wealth from organization's intellectual capital (Bukowitz & Williams, 2001).

The following definition has been formulated based on the understanding of KM from the majority of researchers. I will provide the definition first and then will analyze it through the literature review. Hence, KM can be defined as follows:

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).

Internal knowledge sources

Internal knowledge sources can be human capital which includes employee knowledge, skills and abilities (KSA) (Lopez-Cabrales, Perez-Luno & Cabrera, 2009). It has been argued that workforce with particular skill profiles can facilitate certain market strategies (Hall & Soskice, 2001). The cited authors identified three types of skills associated with different market strategies: firm-specific skills, industry-specific skills and general skills. Firm-specific skills are acquired by on-the-job training. They are specific for the certain organization and are valuable only to this employer not others. These

skills are unique; they are hard to be transferred to other organizations and even to other positions (Lopez-Cabrales, Perez-Luno & Cabrera, 2009). These skills can't be duplicated by competitors.

Industry-specific skills are obtained by vocational schools or apprenticeship and once certified, are recognized by any employer within a specific industry (Hall & Soskice, 2001). As the authors state, they can be transferred to other organizations within the same industry. Firm-specific and industry-specific skills can be identified within specialist knowledge. The latter stands for the knowledge which is "deeper, localized, embedded, and invested within particular knowledge domains" (Kang & Snell, 2009, p.68). Both, firm-specific and industry-specific skills contain very narrow areas of specialization. Their capacity can be connected to exploitive learning (Kang & Snell, 2009). Grant (1996) argues that "an increase in depth of knowledge implies reduction in breadth" (p.377). Hence, this leads to the statement that specialized knowledge holders tend to be narrow oriented in certain knowledge domains.

On the contrary, generalists are multi-skilled with various capabilities that can be used in different situations. They carry multiple knowledge domains; they can have various interpretations of problems and situations and provide knowledge immediately available for alternative activities (Kang & Snell, 2009). General skills are recognized by any employer and they're independent of firm or industry (Hall & Soskice, 2001). So, they can be transferred to any organization within any industry and they're more determined for explorative learning (Kang & Snell, 2009).

I can argue that there can be individuals who are carriers of both types of knowledge domains. On the other hand, almost every organization encompasses specialist and generalist knowledge holders. For instance, Grant (1996) provides a hierarchy of capabilities (p.378) where one can see that starting from the top, from more broad types of functions one can reach more narrow specialized employees at the bottom of the hierarchy. The author also defines the vertical aspect of this hierarchy, calling it cross-functional capabilities, which he states is more important to bring input into output. For the interest of this research internal knowledge sources, such as human capital will be defined in terms of specialist and generalist knowledge.

External knowledge sources

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). They're essential knowledge repositories for the effectiveness of organization. It has been argued that constantly tapping information from the market can increase clarity of organizational vision and strategy (Kohli & Jaworski, 1990). The authors also state that the market orientation can improve the performance of the organization and can lead to greater customer satisfaction and

repeated business. In this research external knowledge sources will be referred to market, customers and competitors.

KM channels

Mostly it is accepted that KM is concerned with knowledge building, renewal, transfer and using in order to facilitate achieving competitive advantage (Bhatt, 2000; Demarest, 1997; McCampbell, Clare & Gitters, 1999; Soliman & Spooner, 2000; Wiig, 1997). Researchers identified two dimensions of KM: *outcomes* and *properties*. Three outcomes are knowledge creation, retention and transfer. Three properties of context where KM appears are properties of units (e.g. an individual, a group, or an organization), properties of the relationships between units (how units are connected to each other to ease transfer of knowledge), and properties of the knowledge itself (tacit vs. explicit, private vs. public etc.) (Argote, McEvily & Reagans, 2003). These dimensions of KM describe whole picture of what knowledge management is about. Even though the author calls knowledge creation, retention and transfer as outcomes of KM, actually they are parts of the knowledge management process. I chose specific KM processes that majority of researchers identify as important elements. They are knowledge creation, acquisition, transfer and responsiveness (Bhatt, 2000; Darroch, 2003; Demarest, 1997; Holsapple & Joshi, 2004; McCampbell, Clare & Gitters, 1999; Soliman & Spooner, 2000; Wiig, 1997). I will call them ***KM channels*** since they are tools, curriers of organizational knowledge through which value can be created.

2.1.1 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). The cited authors mention that when talking about organizational knowledge creation it is how individual knowledge is connected with the one of organization. Below I will discuss how new knowledge can be created by using knowledge, skills and ability (KSA) from internal sources such as human capital and from external sources such as customers, market and competitors.

The question is what KSA of human capital is necessary in order to promote knowledge creation and how they can differ for specialists and generalists. I will discuss three features critical for knowledge creation: experience, learning and teamwork.

Bhatt (2001) says that new knowledge creation should not necessarily start from the *scratch*; it can be built upon existing capacity. I've mentioned earlier that knowledge development requires time and it is derived from experience (Swap, Leonard, Shields & Abrams, 2001). Lessons learned from the past can greatly contribute to better decisions in the future, "knowing more usually leads to better decisions than knowing less" (Davenport & Prusak, 2000, Complexity section, para.2). Experience is thus very

much valued by organizations since it's the tool that supports generation of specific understanding of certain organizational routines that can be embedded in the minds of employees intuitively, so when the relevant situation develops applicable reactions and decisions follow quickly (Davenport & Prusak, 2000). The cited authors mention about the importance of *framed experience* accompanied with contextual information and expert insight. This pre-existing knowledge influences greatly how new knowledge is encoded (Swap, Leonard, Shields & Abrams, 2001). It becomes like a hook to connect to new information. As Dove (1999) states "new knowledge is both created and assimilated naturally when it shares some common pattern with old knowledge" (p.25). This notion is in line with the empiricism approach which defines human as a *tabula rasa* in other words a *blank board* where knowledge is written owing to experience. However, Kant believed that in addition to experience logical thinking is necessary so that together they form knowledge. This view comes together with rationalism approach stating that human is born with the base knowledge; it is the essence of rational thinking which together with base understanding forms wisdom.

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. During years they develop specific, deeply embedded knowledge which can be hard to be imitated by other organizations. Hence, accumulating experience by a certain employee within specific organization can be decisive for building specialized knowledge. 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). The authors elaborate on this notion by arguing that employees who are able to identify knowledge sources from different domains rather than their own (sometimes even unknown) are able to develop completely new ideas. This can lead to introducing more radical ideas as they state. As it can be argued based on these authors, lack of shared experience means having various experiences in a group of employees. I assume that this notion can be characteristic for generalist knowledge holders since they possess the KSA which is based on general understanding of different organizational knowledge domains and can contain experiences different from firm-specific knowledge. To put this in other terms, general knowledge holders are able to search for divergent ideas from their group and adapt it to the existing domains in a way that completely new ideas are introduced.

However, to become an expert it requires at least 10 years of experience to develop (Swap, Leonard, Shields & Abrams, 2001). The authors argue that expertise is usually developed by learning-by-doing. This is the form of active learning, experiencing actual work to develop better understanding of the process. It has been argued that learning is the process when new knowledge is created (Darroch & McNaughton, 2002; Dove, 1999; Lee & Choi, 2003; Kamoche, 1997). It is a basis and can be considered as a pre-requisite for new knowledge formulation. Dove (1999) compares the whole

process of knowledge management with learning embedded in various practices of KM. As he states KM activities are all about "what should be learned, when it should be learned, and who should be learning it" (p. 25). While defining knowledge management above I've stated that certain process of tacit knowledge transformation can be considered as a process of learning (internalization pillar). And learning has been considered as an important process for knowledge intensive companies.

Two types of learning have been recognized: single-loop learning and double-loop learning (Lado & Wilson, 1994). The authors argue that first refers to "learning by repetition approach" when employees accumulate knowledge, skills and ability after years of service in the organization (p.706). It can help employees to make incremental adjustments in contributing to the organizational performance. It is the process that maintains central features of organizational rules and restricts itself for detecting or correcting errors (Fiol & Lyles, 1985). As the term also denotes, it is the type of learning which takes place within the single area of knowledge domain. This process refines and ensures that organizational routines and long time accepted rules are in place, that knowledge accumulated during the years is constantly applied. The authors refer to it as a lower level cognition. Single-loop learning is comparable with exploitative learning which stands for refining and enriching existing knowledge (March, 1991). Value creation can be achieved by improving existing knowledge, by in-depth search of narrow knowledge domains (Kang, Morris & Snell, 2007). On the other hand, double-loop learning permits organizational members to question existing performance standards, norms and beliefs (Lado & Wilson, 1994). The term itself says that this type of learning encompasses more than one knowledge domain. It encourages employees to improvise and provide new ideas and reflect on their actions to generate new understandings from those actions. This type of learning attempts to adjust overall rules and norms (Fiol & Lyles, 1985). The authors state that double-loop learning is based on higher level cognition, where existing norms are questioned and the focus is placed on broader perspectives of organization. This type of learning is comparable with explorative learning, it stands for engaging in knowledge domains which are new for the company (March, 1991). Explorative learning can bring new customer value with new knowledge or replace organization's existing knowledge to enrich existing customer value (Kang, Morris & Snell, 2007).

Single-loop learning can be characteristic for specialists since this is the knowledge which is accumulated after the years of experience, I've already argued about the link between experience and specialist knowledge. In addition, specialists are holders of in-depth knowledge and well aware of existing knowledge domains. Learning by repetition approach, by routine, searching and improving existing knowledge, skills and abilities can be typical for specialist knowledge holders. On the other hand, double-loop learning requires knowledge from different domains in order to have broad picture and question existing ones. It is based on broad and general knowledge search (Kang, Morris & Snell, 2007). Engaging in exploration of new knowledge domains can require general KSA in order to be

able to absorb various sources and digest in the reality of organization. Hence, this type of learning is typical for generalists.

I've already discussed about the importance of experience as a pre-existing knowledge. This phase of knowledge creation is in line with Nonaka's (1994) internalization and socialization process. These are the processes when tacit knowledge is transmitted by brainstorming and teamwork. So, constructive meetings, discussions and arguments can lead to new ideas, solutions or suggestions. It has been recognized that collective gathering and teamwork is a very efficient way of knowledge creation (Osterloh, 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). In cross-functional teams employees from different professions and jobs are collected so that all knowledge and skills necessary for the team outcome are present (McDermott, 1999). Communities of practice and teamwork can greatly support collaborative learning which I already stated as an important factor in knowledge creation process (Dove, 1999). Some authors even explicitly argue that the potential for new knowledge lies in the team and its interaction (Madhavan & Grover, 1998). The same authors connect the cross-functional teamwork with T-shaped skills. They argue that in addition to having a deep knowledge around the subject, understanding how this interacts with others is crucial. However, there are limitations in teamwork, when they cannot make a connection with other teams and can become isolated (McDermott, 1999). As the author mentions, this can hinder the assimilation of knowledge sources from outside and thus hinder new idea generation. The reasoning behind is that new knowledge formation comes from intersection of different disciplines (Leonard, 1997), and when teams are not linked with other teams or outside stakeholders they lose the possibility to experience new insights of the similar activities (McDermott, 1999). The lack of this opportunity hampers new idea generation. However, some authors argue that successful teams can form intensive networks with inside and outside stakeholders of the company (Ancona, Bresman & Kaeufer, 2002). The authors elaborate about X-teams, the ones who are out-of-boundary oriented, seeking for up-to-date information, have constant ties with surrounding environment and connect to change initiatives. They can be regarded as tools to obtain necessary knowledge from outside resources. It has been argued that horizontal and informal communication is utterly beneficial for coordination of departments and attainment of overall goals (Kohli & Jaworski, 1990). The authors stress the fact that interdepartmental meetings can be very valuable for sharing market information. This shows how one sub-component of knowledge creation can be utilized to absorb information from external knowledge sources.

Knowledge creation process in my understanding is basically based on internal sources. External sources can be used to acquire knowledge in order to later be utilized for knowledge creation. Creating

a knowledge vision, a mental map of knowledge gaps, what it is given at present and what knowledge should be sought in the future can serve as a justification for knowledge creation (Ichijo, 2007; Nonaka & Takeuchi, 1995). It can help focus on certain external knowledge resources. As Ichijo (2007) states, they can be guiding principles to what direction the knowledge creation and innovation should be pursued and what competencies might be necessary for this. I will discuss below about the types of knowledge acquisition.

2.1.2 Knowledge acquisition

Knowledge acquisition is an activity when knowledge is identified in the entity´s environment and is made 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. Internal acquisition can be done through regular meetings and employee surveys, while external acquisition can be achieved through the contact with customers, suppliers, stakeholders or competitors (Darroch, 2003). As the author argues for innovative company it is very important to have a clear picture about market requirements, industry trends, competitors and technological developments.

For the purpose of internal knowledge acquisition employee surveys can support to get necessary information about their opinions and attitudes towards work. I assume this can be an important part of knowledge management process. For instance, employees who are satisfied and happy with working environment, who are committed to their jobs will probably be willing to share knowledge and contribute to overall objective of the organization. Employee surveys can help find out about the trust level between employees and between employees and management. I will argue later that trust is an important pre-condition for sharing knowledge. Another form can be regular meetings, dialogues and suggestion boxes. I will discuss later that certain HR practices can also be beneficial for acquiring employee knowledge, such as performance appraisals and training programs.

On the other hand, it is important that information is collected from market, customers and competitors (Darroch, 2003). For instance, regular market research, survey of end users as well as information about competitors are crucial sources for knowledge acquisition. As stated earlier, knowledge acquisition from external sources can be beneficial for further new knowledge creation and application (Shipton, West, Dawson, Birdi & Patterson, 2006). The authors mention that the contact with customers and suppliers can lead employees to question their perceptual models and enrich their opportunities for change. Generation of market intelligence can be achieved not only by customer surveys but with frequent meetings and discussions with customers, by analyzing sales reports, obtaining information from trade press in order to know about the tendencies of competitors (Kohli & Jaworski, 1990). As the authors cite, this information can be beneficial to find out future needs of

stakeholders and later align certain practices to bridge the gap of knowledge requirements and thus innovate to meet the needs of customers.

2.1.3 Knowledge transfer

Since the knowledge base is expanding new knowledge makes old become outdated faster (Dove, 1999). As the author argues this pushes the speed for diffusion of new knowledge so that it can bring return on investment. Hence, timely knowledge transfer is as important as its creation. Knowledge dissemination can help to share the created knowledge at the individual or group level within the whole organization (Nonaka & Takeuchi, 1995). 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).

If the knowledge accumulated within or outside of an organization is not transmitted to others, its value might be lost. For this, frequent communication with target people is very important (Ichijo, 2007). Knowledge diffusion is important for creating new knowledge and enabling innovation (Saenz, Aramburu & Rivera, 2009). So it becomes obvious that knowledge creation and dissemination are interdependent processes, contributing to each other.

There are certain types of knowledge sharing mechanisms, such as codified or IT-based and personalized or people-focused (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). The process is referred as *people-to-document* approach, when knowledge is extracted from the person who owned it, is made independent from the person who developed it and is stored in the codified form so that it can be reused later by other employees (Hansen, Nohria & Tierney, 1999). The process of knowledge reuse can support creation of new knowledge by providing new combinations of existing knowledge (Majchrzak, Cooper & Neece, 2004). Knowledge reuse can save work and reduce communication costs (Hansen, Nohria & Tierney, 1999). Hence, knowledge transfer can become pre and post conditions of new knowledge creation. IT-based knowledge sharing mechanisms can include e-mail, online discussion forums, intranet, extranet, groupware tools, online knowledge repositories and etc. IT tools can minimize the time for the transfer of information, since a person can access required knowledge source without searching and communicating with the person who holds this knowledge (Hansen, Nohria & Tierney, 1999).

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 people to share knowledge and communicate rather than store it (Hansen, Nohria & Tierney, 1999). For instance, authors mention that e-mails, phone calls or videoconferences can be used to share personalized knowledge. People-focused tools can incorporate meetings, forums, storytelling, lessons learned, best practice collection, mentoring and job rotation (Saenz, Aramburu & Rivera, 2009). This approach is comparable with Nonaka's (1994) socialization phase when tacit knowledge is shared by interaction between individuals. Personalization strategy should be used for those organizations where tacit knowledge is important, since tacit knowledge resides in persons (Hansen, Nohria & Tierney 1999). To make a connection between knowledge transfer and knowledge creation more tight, some authors argue that face-to-face communication will be more effective for creating new knowledge (Madhavan & Grover, 1998).

IT tools can help people find required knowledge (Dove, 1999). For instance, help desks and advisory services can connect people who need certain know-how with those experts who have it (Ribiere & Roman, 2006). However, it has also been argued that knowing who has knowledge is no more important rather than who needs knowledge (Dove, 1999). This notion leads to the perception of knowledge vision stated earlier, which can structure knowledge gaps for further application.

It's not the question which approach can benefit or hinder organizational performance, it depends on the strategy and focus on either approaches (Hansen, Nohria & Tierney, 1999). The author mentions 80% by 20% approach, where 80% is a dominant strategy either codification or personalization and 20% is a supporting strategy.

2.1.4 Knowledge responsiveness

Knowledge responsiveness means that organization responds to the various types of knowledge it acquires or has access to (Darroch, 2003). For instance, knowledge acquired from employee surveys or from stakeholders of the company, it needs to be responded in order to put this knowledge into practice. Otherwise, the whole process of knowledge acquisition can lose its meaning. Kohli and Jaworski (1990) argue that knowledge can be acquired and disseminated but little can be achieved if it is not responded. They underline the importance of responsiveness to market and customer needs. "Knowledge has no value until it's applied" (Dove, 1999, p.19). As the author states, when new knowledge is applied it introduces a change which can bring value to the organization. This is actually innovation that comes from the application of new knowledge and change accordingly. I will argue later about the link between KM and innovation.

Applying knowledge at the right time and place is as important as other KM channels (Dove, 1999). So speed of responding to acquired knowledge can be decisive for the organization. Besides,

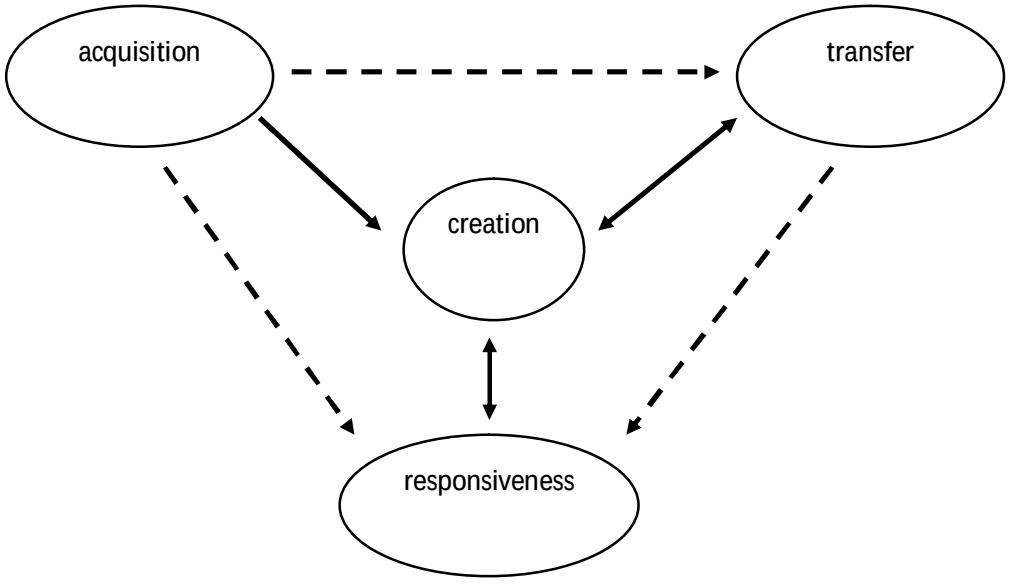
responsiveness can guarantee that right knowledge is available to the right people; it can help plan future steps in knowledge management, such as “satisfy current needs and weed out obsolete needs everywhere in the organization” (Dove, 1999, p. 24). Application to the right processes at the right time carries the meaning that the organization is aware of the knowledge gaps and can acquire necessary knowledge when there is a requirement in the organization. In other words, relevant knowledge should be available when there is a need for that in the company (Demarest, 1997). It also includes the process of making available knowledge to the right people, those who need it for further elaboration, transfer or use. In addition, after actual application of knowledge learning environment is formed, new things are discovered for further improvement. Hence Total Quality Managemnt (TQM) principle is ensured (Lom, Ahmed & Zairi, 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, I will argue later that from different KM channels knowledge creation carries most valuable meaning for the benefit of innovation in the company. Holsapple and Joshi (2004) describe the process of knowledge generation as an entire process of acquisition, transfer and responsiveness. Hence, in this research the focus will be placed on the process of knowledge creation and the rest of the KM channels will be defined as supporters of knowledge creation process. ***Figure 1*** shows the relationships between KM channels, where knowledge creation has a central place. To be more specific, acquisition can play a huge role in bringing new insights for further new knowledge generation, after the creation of new knowledge, it needs to be disseminated and responded; otherwise the value of knowledge creation will be lost. I’ve already argued that knowledge generation and transfer are mutually beneficial activities; two-way arrows depict this process in the model. In addition, created knowledge can be responded directly. At the same time application of knowledge can become a source of new insights and bring input to knowledge creation. Hence, another two-pointed arrow depicts this relationship. The doted arrows show another circle that can be also relevant for knowledge management process, however for the interest of innovation it is essential that acquired knowledge is transmitted into the knowledge which can bring value for the innovativeness of the company. Hence, it should be a source for new knowledge creation before it is transferred and applied.

But how can be measured knowledge management? The literature does not provide absolute measurement matrix, however there are a number of suggestions to carry out the measurement based on patents, trademarks, copyrights, trade secrets, customer satisfaction, financial bottom line, effectiveness of business processes, ability to sustain innovation and changes (Gupta, Lyer & Aronson, 2000). KM has also been measured according to the employee satisfaction, training hours, employee retention, autonomy and number of new ideas generated (Popadiuk & Choo, 2006). Since knowledge itself is an abstract phenomenon it will be easier to understand it in relation to other variables.

Therefore, in this research KM will be operationalized in connection with HR practices and types of innovation. Since I argue that outcome of KM can be innovation, I can measure it by comparing turnover rates coming out from different innovation oriented projects.

Figure 1. Relationships of KM channels



2.4 What is innovation?

The recent tendencies of the globalized world make firms to be equipped with tools and key instruments to keep the competitive advantage. Those tools and instruments can be shaped by strategies aimed for innovation since if the firm stops improving it will be replaced by the competitors that do (Hayes, Pisano, Upton & Wheelwright, 2005). I can argue that every company introduces certain innovative practices on a certain level and in different way. In literature on strategic management innovation it is recognized as a mechanism for firms "to create value and sustain competitive advantage in the increasingly complex and rapidly changing environment" (Chen & Huang, 2007, p.104). Innovation has also been defined as a "means of doing things differently", as a phenomenon destructing status quo (Evans, Doz & Laurent, p.164). It has also been considered as a process which is initiated by the perception of a new market or service opportunity for a technology based invention which can direct to more development of production and marketing activities for the commercial success of invention (Garcia & Calantone, 2002). Thus, innovation includes market introduction and as authors mention it has iterative nature, meaning that it requires introduction of a new innovation and then improved innovation. It includes not only laboratory assessment but also manufacturing, marketing, distribution, servicing and product upgrading later (Garcia & Calantone,

2002). There is an interesting distinction provided by cited authors about invention and innovation – the discovery that stays in the lab is invention, but the discovery that goes out of the lab, adding economic value is innovation.

It has been researched that innovation improves organizational performance however different types of innovation affect different aspects of organizational performance (Subramanian & Nilakanta, 1996).

Research identified types and categories of innovation, among those are technical and administrative, modular and architectural, product and process, radical and incremental innovations (Benner & Tushman, 2003; Koberg, Detienne & Heppard, 2003; O'Reilly & Tushman, 2004; Subramanian & Nilakanta, 1996). However, most researchers agree to categorize innovation among four pillars: process vs. product and radical vs. incremental (or exploitative vs. explorative). Process innovation is related to improvement of procedural practices to contribute to product development (Hayes, Pisano, Upton & Wheelwright, 2005; Garcia & Calantone, 2002).

Incremental or exploitative innovation is characterized as making small changes in a "technological trajectory" while at the same time meeting the needs of existing customers (Benner & Tushman, 2003, p.243). It can be beneficial for "technologically mature market" and later can facilitate organization's shift to new technological arena (Garcia & Calantone, 2002, p.123). As the cited authors mention incremental innovation is a main driver for most of the organizations.

Radical or exploratory innovation changes fundamentally "technological trajectory" and is directed to serve new customers and markets (Benner & Tushman, 2003, p.243). Radical innovations can create a demand that has not been recognized before (Garcia & Calantone, 2002). The new demand, as the authors state, promotes development of new industries, competitors, marketing activities. Until new market evolves and new competitors come in the progress toward market might be slow (Garcia & Calantone, 2002). As the authors state incremental innovation can happen at any stage of new product development, at the conceptualization or mature stage.

Radical innovation has been compared to the ***business process engineering approach*** while incremental innovation is connected to the ***total quality management*** movement (Hayes, Pisano, Upton & Wheelwright, 2005). The difference has been made also in terms of time, for instance early stage of diffusion and adoption of products are called radical innovation and at the advanced stages of innovation it is considered to be incremental innovation (Garcia & Calantone, 2002). Exploration is the process of ***out of box thinking,*** when completely new knowledge is formed from the scratch and developed later to achieve long-term goals. It is comparable to empiricism discussed earlier in terms of writing utterly new ideas on a blank board. On the other hand, rationalism is more connected to

incremental innovation, when continuous thinking and elaboration develops novel steps for short-term effectiveness. Compared to incremental innovation radical advancements can be rare (Garcia & Calantone, 2002).

I can assume that both processes and products can be improved radically or incrementally. However, researchers are connecting process development to incremental innovation and product development to radical innovation (Koberg, Detienne & Kurt, 2003). Once product innovation is standardized, process innovation evolves to improve output productivity (Garcia & Calantone, 2002). On the other hand, it is believed that the process improvement can decrease radical innovation (Benner & Tushman, 2003). The question is which strategy is most beneficial for the company or how to balance the tension between those two. Today more managers and leaders realize that both types of innovation are necessary for the success of the organization (James, 2002). Researchers believe that driving forces of the company depend on how to simultaneously exploit technologies in order to maintain efficiency and create variety through exploration. This means that organizations should be able to switch smoothly between "organic" and "mechanistic" structures (Benner & Tushman, 2003, p.247). These types of organizations are called ***ambidextrous***. It resembles to Nonanka's (1994) "hypertext organization" where he incorporates knowledge base as a third layer. This system requires utmost monitoring and effective management to constantly weigh the benefits from contradictory approaches. Exploitative and explorative orientation requires completely different structures, processes and administration. Hence, it is believed that the effectiveness of performance in ambidextrous organizations is believed to be in balancing these two opposites. Benner and Tushman (2003) argue that these "organizations are composed of multiple tightly coupled subunits that are themselves loosely coupled with each other" (p.247). Hence, it is the job of senior team leaders to keep consistency on a higher level of organization structure. It is also argued that these contrasting units should physically be kept separated, have distinct measurement and incentive system.

While defining the innovation and its types it is also important to distinguish between the levels of innovation. Most of the researchers agree on firm's perspective to define ***newness*** of innovation, meaning that, innovation is considered in terms of being new to the firm (Garcia & Calantone, 2002). However, the authors found out that others consider innovation as new to the world, new to the adopting unit, new to the industry, new to the market or new to the consumer.

Since this research is based on the data collected from profit and non-profit organizations the innovation will be defined not in terms of invention rather than a need for any company, as a part of strategic plan for any organization. My focus will be on explorative/radical and exploitative/incremental types of innovations. The level of investigation in these types will be defined

from firm's perspective. Hence, both types of innovations will be considered whether it is new for the company itself rather than industry or customers.

2.5 Knowledge management and innovation

Information is recognized as a driving force for innovation. Since "information is the result of knowledge evolution" (Carneiro, 2000, p.92) many researchers prove the link between KM and innovation (Chen & Huang, 2007; Carneiro, 2000; Cavusgil, Calantone & Zhao, 2003; Leonard & Sensiper, 1998; Popadiuk & Choo, 2006; Ruggles & Little, 1997). Some even argue that it is an *antecedent of innovation* (Darroch & McNaughton, 2002). 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). They can be new technologies or human resources equipped with unique knowledge difficult to be imitated by competitors. As Godbout (2000) states "without knowledge and know-how, organizations become dependent on suppliers and external technology and fail to control the key resources of their sustainability" (p.78). Ruggles and Little (1997) identified that "innovation is 90 % learning and knowledge driven" (p.6). As Carneiro (2000) says "innovation highway depends on the knowledge evolution" (p.87). In addition, it is also important to reuse knowledge. In contemporary market only innovation is not enough, it is crucial to innovate constantly, hence reuse knowledge (Demarest, 1997). 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.

The question is which KM channels are most important for supporting innovation? Researchers admit that knowledge creation has important implications for innovativeness (Krogh, Ichijo and Nonaka, 2000; Lee & Choi, 2003; Popadiuk and Choo, 2006; Ruggles and Little, 1997). Hence, as stated earlier in this research the focus will be placed on the process of knowledge creation. As I described earlier knowledge creation is based on symbiotic relation of tacit and explicit knowledge.

Nonaka and Takeuchi (1995) describe how Japanese companies became successful, how they achieved continuous innovation. They argue that new knowledge creation was a crucial determinant. Japanese firms looked outside of the company, to suppliers, customers and government agencies for new insights and information. For the development of new products and processes the key driver for them was conversion of knowledge – from outside to inside, then sharing within the company, storing, utilizing and sending back to the market in the form of new products. What they emphasize most is the

superiority of tacit knowledge, which is the tool that Japanese companies used to achieve success in a competitive market. They connect tacit knowledge to innovation directly and say that understanding the importance of tacit knowledge changes the approach to innovation. In addition, "studies of technological innovation and diffusion have increasingly identified tacit knowledge as an important component of the knowledge used in innovation" (Lam, 1998, p.1).

But how can knowledge creation promote different types of innovations? Two opposing assumptions were found. Hayes et al. (2005) argue that tacit knowledge is mostly connected to exploitation "since the availability of explicit knowledge would enable one to implement directed improvements that were larger than those achievable by simply feeling one's way along" (p.293). On the other hand, 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. I agree with the second approach since I believe that for radical innovation more intuitive, unstructured tacit knowledge is applicable, which is determined for further experimentation. There is no time for codification.

Kang and Snell (2009) argue that explorative innovation is achieved by utilizing external knowledge, while exploitative innovation is based on inside knowledge resided within the firm. They oppose to each other specialist and generalist knowledge. I´ve discussed above the characteristics of both types of human capital. The first is compatible with exploitative innovation and the latter with explorative innovation. Since employees with specialist knowledge carry more in-depth understanding of specific knowledge domains they usually are more capable of assimilating knowledge within specific parameters. Generalists possess diverse mental models and are opting to discover and apply knowledge in new sectors, they find it easier to adapt to new domains.

To consider the factors of the knowledge creation process I can argue that some of them can contribute to different types of innovations. The factors discussed were – experience, learning and teamwork. Earlier in the paper I've connected existence of experience with specialist knowledge holders and the lack of shared experience with generalist knowledge holders. Accordingly, I can assume that experience can be a supporter of exploitative innovation, while the lack of shared experience can be critical for explorative innovation. Likewise, single-loop learning can be linked to exploitative innovation and double-loop learning to explorative innovation. Besides, cross-functional teams will be argued to be beneficial for explorative innovation. I will discuss each argument in more detail.

Experience

It can be stated that for exploitative units experience matters. Reflecting on past lessons and adapting current practices accordingly can contribute to exploitative 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 (Bartol & Srivastava, 2002; Bhatt, 2001Cohen & Levinthal, 1990). Gaining experience at a specific context can be a source for unique knowledge development. These employees have rare knowledge, skills and ability which are not common at the labor market (Lopez-Cabrales, Perez-Luno & Cabrera, 2009). As the authors argue, however, unique, experiential knowledge is difficult to transfer to other positions. If I can resemble this stage to the externalization and combination pillars from Nonaka's (1994) model then it becomes clear that frequent dialogues and collaboration can be beneficial for this type of knowledge transfer. Barney (1991) states, that in order to achieve competitive advantage unique knowledge should be valuable, difficult for competitors to imitate and difficult to substitute.

In contrast to this notion it is argued that the lack of shared experience can facilitate the success of explorative innovation (Majchrzak, Cooper & Neece, 2004). I've already elaborated on this concept earlier in the KM section. 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 for 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 in order to integrate with existing ones. The incentives can be lack of shared experience. The reasoning is that in a group of employees with diverse experience it is a challenge and motivation for them to integrate, digest different insights in order to come up with divergent ideas.

Learning

As regards learning as another factor for knowledge creation, I've earlier connected single-loop learning with specialist knowledge holders and double-loop learning with generalist knowledge holders. Consequently, the can be linked to exploitative innovation, whereas the latter can be contributory for explorative innovation. To discuss each of the assumption I should state that single-loop learning requires experience, so that employees learn by repeating their existing activities, this I assume can ensure the quality of their work by finding new ways how to improve, brush up existing tasks by performing them in a more qualified way. Accordingly, I can assume that it is more connected to exploitative innovation where incremental changes are characteristic. Kang, Morris & Snell (2007) directly link single-loop learning with exploitative innovation while arguing that the value creation can be achieved by improving existing knowledge, by in-depth search of narrow knowledge domains.

On the other hand, as discussed earlier double-loop learning requires questioning existing activities and reflecting on their actions. While having general knowledge about other domains, they can find new solutions, ideas to improvise their actions and create drastically different knowledge from existing activities. They engage in multiple knowledge domains (Kang, Morris & Snell, 2007) in order to diverge from existing practices and thus, create new ideas. This leads to the arguement that double-loop learning can be a supporter of explorative innovation.

Teamwork

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). "Cross-functional groups consist of members from different functional areas" (Keller, 2001, p.547). As the author argues this type of teams increases the level of communication outside of particular project, clear link with customers and speed to market. It should be mentioned, however, that cross-functional groups may increase costs, stress and low group cohesiveness (Keller, 2001). Olson, Walker and Ruekert (1995) state that cross-functional teams can increase the effectiveness of new product development. A number of authors argue that cross-functional groups increase the quality of new product development at a lower cost and their speedy introduction to the market (AitSahlia, Johnson & Will, 1995; Lutz, 1994). Based on this review, I can argue that teamwork of employees with diverse backgrounds can increase development of divergent ideas and lead to explorative innovation.

The following propositions can be formulated based on the above literature review:

Proposition 1: single-loop learning and experience can support exploitative innovation.
Proposition 2: double-loop learning, lack of shared experience and cross-functional teamwork can support explorative innovation.

I've stated that knowledge creation is the focus of this research since its connection with innovation has been proved. The rest of the KM channels were said to be supporters of knowledge creation process. Earlier I've also mentioned that without other KM channels such as acquisition, dissemination and responsiveness the value of knowledge creation process might not be realized. Thus, it is interesting to see the connection of other KM channels with the types of innovation.

To define the factors for knowledge transfer process, I can argue the connection of codification strategy with exploitative innovation and personalization strategy with explorative innovation. The researchers argue that based on the strategy that companies choose the respective KM strategies should be aligned (Hansen, Nohria & Tierney, 1999; Ribere & Roman, 2006). As the authors state companies focusing on standardized or mature products and explicit knowledge are more inclined to use codification strategy. On the contrary, the companies emphasizing customized or innovative products and tacit knowledge use personalization strategy. I can argue that the first is comparable with exploitative innovation, whereas the second is associated with explorative innovation. To discuss both arguments, first should be mentioned that standardized products do not vary if at all and mature products are based on well understood tasks that can be codified (Hansen, Nohria & Tierney, 1999). The development of these products can be assumed to be based on incremental adjustments since they don't require introduction of completely new ideas, methods or processes. In addition, explicit knowledge is characteristic for exploitative innovation where communication is more codified and formalized as stated earlier. As a result, codification strategy can be more supportive for exploitative innovation.

To discuss the connection of personalization strategy with explorative innovation, it has been argued that companies introducing customized or innovative products are inclined to meet the needs of particular users whose requirements might be fluctuating or sometimes dramatically different (Hansen, Nohria & Tierney, 1999). As the authors state codified knowledge might be of low value for these kinds of products. It can be argued that meeting customer demands or introduction of completely new products can require divergent ideas. The development and timely application of these ideas can best be achieved by person-to-person communication. Consequently, this can lead to more explorative innovation. In addition, tacit knowledge being difficult to articulate should be shared in a personalized way which can be beneficial for explorative innovation as argued earlier. As a result, personalization strategy can be a supporter of explorative innovation.

Based on the above analysis the following propositions can be formulated:

Proposition 3: codification strategy can support exploitative innovation.
Proposition 4: personalization strategy can support explorative innovation.

Table II below summarizes major findings on the link between KM and two types of innovation: exploitative and explorative.

Table II. KM and two types of innovation.

Exploitative	Explorative
Explicit knowledge	Tacit knowledge
Specialist skills	Generalist skills
Existing knowledge	Divergent knowledge
Experience, preexisting knowledge	Lack of shared experience
Single-loop learning	Double-loop learning
Individuals	Teams
Codified knowledge	Personalized knowledge

2.6 HR practices in relation to knowledge management

In above sections theoretical arguments were presented about the importance of KM channels for the generation and support of innovation in the company. Knowledge creation facilitates introduction of new ideas, new ways of thinking, and different perception of existing concepts. The core concept behind this lies in the phenomenon that intellectual capacity might reside in the company all the time but without the possibility to be detected and what most important be utilized in the benefit of organizational interests. As Polanyi (1967) said "we can know more than we can tell" (p.601), hence detection of hidden capacity might play a crucial role for many advantages of the company. However, it has been mentioned that created knowledge needs to be disseminated within the appropriate units and applied in order to bring value to the company. But how can the knowledge be detected, transferred and applied? What strategy is necessary for this? What practices should be implemented to support this process? Research shows that introduction of proper human resource activities might play important role in knowledge management activities.

As stated above knowledge flow cannot exist without a humane factor. This notion is strengthened by a number of authors arguing that KM is actually developed from human resource management (Yahya & Goh, 2002; Soliman & Spooner, 2000; Bhatt, 2001). As Scarborough (2003) states KM has important implications when managing human resources, especially knowledge sharing. The author states that innovation arises at the intersection of knowledge flow and people flow. HR flow will promote 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. He states that innovation is simply "integration of knowledge with action" (p.505) when expert knowledge is applied to the specific outcomes of product or process innovation.

A lot of researches focus on the role and function of HRM in managing knowledge. The analysis is more general on how HRM can contribute to identification and application of knowledge in order to

reach company objectives. For instance, Soliman and Spooner (2000) discuss about knowledge gaps and the function of HR department in this process however preciseness and practicality of this process is lacking. The authors state that HRM should play an important role in monitoring, measuring and intervening in construction, embodiment, dissemination and use of knowledge. Nevertheless, in this process specificity is lacking. A number of other authors link the function of HRM to KM with the purpose of sharing knowledge (Hislop, 2002) and how employees should be willing to bring tacit knowledge into explicit. But the analysis lacks understanding that tacit knowledge might be embedded in the minds of employees without realizing it. Considering the notion of Hansen, Nohria & Tierney (1999) focusing on organization strategy to plan KM activities is vital. Hence, understanding what kind of knowledge can be valuable for the organization (e.g. tacit vs. explicit) and what KM channels are essential to serve for the strategy (e.g. knowledge creation) HRM strategies can be aligned accordingly. In other words KM can be driving force and guiding principles for HRM strategies. Alignment of these strategies can be realized through effective implementation of HR practices.

HR practices that encourage effective and efficient utilization of knowledge capacity are crucial in achieving company objectives. They can play a vital role in supporting employees to create and share knowledge, such as building helpful atmosphere for knowledge transformation; motivating and boosting the commitment of employees to share knowledge. They can directly influence employee's capability to perform by impacting their knowledge, skills and ability (KSA) (Lopez-Cabrales, Perez-Luno & Cabrera, 2009). HR practices deal with how organizations hire and manage people (Boxal & Purcell, 2008). Delery and Doty (1996) distinguished seven strategic HR practices that are "theoretically and empirically related to overall organization performance" (p.805). They are internal career opportunities, formal training systems, appraisal measures, profit sharing, employment security, voice mechanisms, and job definition.

Recently more attention has been paid to new HR practices or "innovative work practices". Such practices include the use of work teams, job rotation, quality circles, total quality management (TQM), high levels of training and innovative pay systems (Michie & Sheehan, 1999). The researchers identified that firms that use innovative work practices are more inclined to innovate than those that do not use these kinds of practices. Much has also been said about the superiority of ***complementary*** practices over individual ones in terms of the effect on productivity of organization (Ichiowsky, Shaw & Prennushi, 1997). However, there have been other findings that proper application of ***individual*** practices to the strategy of organization will improve performance of the organization (Shipton, Michael, Dawson, Birdi and Patterson, 2006). In this research individual HR practices will be selected and explored in relation with KM channels.

For the relevance of this study HRM strategies contributing to KM and innovation should be selected. Gupta and Singhal (1993) identified four dimensions of HRM strategies fostering creativity and innovation. They are human resources planning, performance appraisal, reward systems and career management. HR planning is concerned with analyzing employee needs to construct effective teams as well as recruitment and selection. I will not focus on recruitment however I will incorporate the essence of teamwork in different constructs of HR practices. Hence, I will investigate the affect of performance appraisal, reward systems and career management which includes training/mentoring and job rotation.

2.6.1 Performance appraisal

For the learning organization where knowledge creation and diffusion is vital development of employees is decisive. One of the major purposes of PA is to aid employees in improving organizational performance (Cummings & Schwab, 1973). In this type of organizations PA should not be based on ranking system, when one employee is evaluated against another based on one dimension, the outcomes of this kind of evaluation will not be proper in terms of employee further development.

PA can lead to either rewards, to training/transfer for improving certain skills or even sanction. Hence, proper evaluation might be crucial determinant for further decisions in the employment issues. On the other hand, it can also be a follow-up activity of a training program to measure its affect on the performance of employee. PA may also give possibility to clarify the level of responsibility (Shipton, 2006). PAs can create incentives to stimulate certain behavior. For instance, evaluating how employees used knowledge assets in a firm during performance reviews can encourage employees to actively acquire knowledge from codified sources (Hansen, Nohria & Tierney, 1999).

PA can also stimulate communication between an employee and supervisor and ensure that the target goals are achieved. During *360 degree* appraisal it can be a two way process, on the one hand providing internal (employees) and external (customers) feedback (Yahya & Goh, 2002); on the other hand, acquiring feedback from an employee being evaluated. This feedback will help to first, understand what knowledge reservoir the organization has in order to try to keep it if required and second, to know what skills the organization lacks (Guzzo, Jette & Katzell, 1985) so that they are acquired through KM activities.

As stated above, in today's rapidly developing world it became vital for innovative organizations to focus on capabilities and competencies of employees rather than jobs. Fluctuating market demands require being in line with ongoing tendencies, hence demanding different capabilities from employees. Amending job descriptions all the time to fit changing organizational objectives might be a very complicated process. Thus, there is a trend of moving from job descriptions to skill descriptions

(Lawler, 1993). This approach is particularly applicable for knowledge intensive companies. PA needs to measure the competencies designed for the certain position and attach them to outcomes achieved (Godbout, 2000). This way the focus of assessment is on skills with ultimate goal how to improve them. In other words, attention is driven to the quality of performance of certain tasks rather than quantity of tasks performed. This attitude in performance evaluation encourages employees to be more proactive, open to new suggestions and more creative.

Some organizations use so called 360 degree appraisal system which includes evaluation from self, supervisors (first, second), peers, subordinates (if any) and direct beneficiaries (such as customer or stakeholders) (Cummings and Schwab, 1973). This is a very thorough evaluation which requires more time and effort. However, depending on the structure of the organization and composition of the tasks one or combination of appraisal methods can be selected. For instance, in an organization which uses flat structure and team work peer evaluation might be more effective, since they have more interaction with the person and might know his/her characteristics better rather than a direct supervisor. They might have more information how keen is the appraisee to share the information in a timely and precise way, how collaborative they are in building new concepts to contribute to the common objective of the department or even organization. Besides, peer feedback will help to define individual contribution of appraisee to teamwork. Nevertheless, there are other factors that can affect the accuracy of this type of evaluation, such as interpersonal trust and noncompetitive reward system (Cummings and Schwab, 1973). In innovative organizations where autonomy is valued self-appraisals might be more applicable. Besides, self-development and personal growth can be enhanced by this type of evaluations. However, to avoid subjective insights it should be combined with the appraisals from at least one of the other parties.

For knowledge intensive companies time is crucial, it is important to monitor and measure the outcomes of implemented projects immediately, so that the applicable instruments are applied. Hence, appraisals should follow the achievement of milestones (Cummings & Schwab, 1993). Gupta and Singhal (1993) believe that mid-year evaluations are beneficial for correcting performance so that employees don't procrastinate. That is, when the major tasks are accomplished. Besides, immediate evaluation will include fresh insights from both sides. Once a year evaluations might not bring appropriate guidance and feedback. On the other hand, it shouldn't take very frequent form to undermine autonomy of the individuals and create the negative control culture.

PAs focused on process evaluation and error avoidance can be beneficial for single-loop learning. To discuss this argument in more detail it should be stated that concentration on the *process* of accomplishing results in order to clearly see what actions facilitated and what hindered the achievement of objectives is essential for exploitative learning. PAs based on process evaluation might

help provide more information to explain the results an employee achieved, e.g. by "behavioral observation scales" (Kang & Snell, 2009, p.81). 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. Single-loop learning or exploitative learning is based on refinement, efficiency and extension of existing competencies and knowledge (March, 1991). Evaluating the process, the road that an employee passed to achieve certain outcomes can stimulate him/her to refine existing knowledge constantly. This can give them incentives to carry out existing responsibilities with high diligence and attention. Hence, more concentration will be placed on existing knowledge domains and on their efficiency. This attitude can encourage employees to focus on the quality of performing certain tasks and try to improve and brush-up the skills needed for this process. Besides, the focus on *error avoidance* during the evaluation might ensure preciseness of performance and more responsibility (Kang & Snell, 2009). It can stimulate employees to be focused again on excellence of the performance, thus ensuring constant improvement and development of existing activities. Specialist knowledge holders are supposed to ensure quality; hence, errors should be avoided so that preciseness and effectiveness are facilitated.

To sum up, when employees are focused on accomplishing their tasks with high quality, when they engage in constantly searching for competence improvement and when they avoid errors to achieve the excellence can be supporter for single-loop learning.

Based on this the following proposition can be formulated:

Proposition 5: performance appraisal based on process evaluation and error avoidance might support single-loop learning.

Motivation for further development is crucial for employees in learning organizations. Hence, during evaluation focus should be placed on progress and positive achievements rather than critique of the reached outcomes (Mumford M., 2000). Criticism might hinder the motivation of an employee to be creative, generate new knowledge and share it. It should be taken into account that employees trying to find best solution might use different rather than established norms to achieve objectives. Even though this type of approach might not be in line with organization requirements they can still provide the best way for accomplishing desirable results. Focusing on positive outcomes can also form positive atmosphere between appraiser and appraisee. This is an opposite approach from earlier stated proposition about the focus on process of achievement. PAs 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 them to search for divergent ideas and 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. Hence, PAs based on result evaluation can stimulate 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). Thus, not focusing on the process of performance can encourage employees to use other alternatives rather than existing knowledge sources in order to achieve required results. This can give them possibility to question accepted norms, be free to diverge from existing knowledge domains, and thus generate new ideas.

PA as one of the HR practices can be regarded as a mechanism of linking employee interests, motivations, capacity and expertise with organization objectives. PA process can act as an effective information exchange tool which might later be transformed into knowledge by the employees. Besides, it can direct KM activities of employees such as rewarding creative behavior, sharing of new ideas but at the same time accepting failures for keeping the motivation mood of employees to learn more. Learning is the part of knowledge transformation and sharing process. As noted above "learning by doing" is essential part for tacit knowledge conversion, however the action is often accompanied by errors or failures. Past mistakes can be a good lesson for future improvement and an essential element 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. I'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 I can argue that performance appraisal which is based on evaluating outcomes of performance, error tolerance and stimulation of teamwork can promote double-loop learning. 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 proposition can be formulated:

Proposition 6: performance appraisal focused on evaluating performance outcomes, including peer feedback and error-embracing practice might support double-loop learning.

2.6.2 Reward systems

Rewards can follow performance appraisal. Gupta and Singhal (1993) argue that in innovative companies employees are rewarded for their effort, not only results. Employees can get awarded for their hard work, dedication and motivation. Rewards can take two forms: financial or non-financial. Both types are important for motivating employees to perform better (James, 2002). However, in case of a financial reward simply raising a salary or giving a bonus might not motivate an employee to stay creative. It should take a moderate form, "just enough that they continue to excel" (Gupta & Singhal, 1993, p.45). There are opposing ideas that pay for performance might undermine motivation of employees to be creative since people feel controlled by another party. On the other hand, others argue that bonuses focused on recognizing one´s contribution or competence can stimulate creativity (Schipton, West, Daqson, Birdi & Patterson, 2006). Hence, for innovative companies it is important that financial rewards are attached to the purpose of promoting knowledge creation and sharing. For creative employees money is not a determinant of a desirable job, they value innovative companies where they can realize their potential (Gupta & Singhal, 1993).

Robertson and Hammersley (2000) argue that reward systems can be important predictors of knowledge sharing. I can assume that non-financial rewards might be more applicable for knowledge-intensive and innovative companies. They can take various forms, such as recognition, promotion, autonomy, empowerment, letter of appreciation etc. Independence is valued in knowledge-intensive companies (Nurmi, 1998). Accordingly, autonomy helps creative employees to develop new ideas by taking self responsibility, benefiting from free time to develop initiatives. By empowering people they get authority and room to be innovative. Delegating responsibilities to subordinates can be one of the forms of empowerment (Yahya & Goh, 2002).

The problem with reward systems might be that they can create dissatisfaction for some people and emphasize rewarded behavior rather than effectiveness. Individuals might try to focus and show their own contribution rather than collaborate effectively with other employees (Scarbrough, 2003). The similar problem appears with teams. As stated above teamwork is important for knowledge creation, but how to balance rewarding teams and individuals? Gupta and Singhal (1993) offer certain

guidelines, when to reward individuals and whole teams. All in all, they suggest rewarding whole teams mostly since there is a proof that they outperform those teams where individuals are rewarded within teams. Besides, there is an assumption that team based rewards might contribute to cooperation and belief that shared knowledge will be beneficial for the whole team and overall performance, so that everyone shares knowledge (Bartol & Strivastava, 2002).

It is essential that the purpose of reward is clear. Following the performance appraisal it can become vivid who took efforts to develop new ideas and who performed well. For knowledge intensive and innovative companies rewards can be attached to skill/knowledge development in order to encourage new knowledge generation beyond current knowledge domain. This incentive can contribute to generalist knowledge advancement; whereas, incentives attached to good performance and their effort to progress, be dedicated and advance in their current job can promote specialist knowledge development (Kang & Snell, 2009). Providing incentives for new idea generation can be beneficial for double-loop learning. As it was mentioned non-financial reward systems can be more beneficial for creative people since money is not the most important motivator for them. The incentives, such as granting autonomy, placing more recognition for suggesting new alternatives for existing norms or practices, or even promoting or shifting to another challenging position can stimulate employees to be more proactive and opt to experiment new ideas. On the other hand, rewarding employees for performing well with fixed bonuses or other fixed incentives, for attempting to improve the norms and practices of their current job can contribute to single-loop learning. I can assume that financial rewards might be more applicable for specialist knowledge holders, because conducting a very special but repetitious work might require certain tangible incentives so that they can make a difference and improve existing practices of their jobs. In addition, these types of rewards can contribute to retaining the employees with a lot of firm-specific experience or specific training. It is essential for the organization to keep the resources that were developed during the years and who possesses capacity which is hard to be imitated by competitors.

Based on this analysis the following propositions can be formulated:

Proposition 7: rewards based on new knowledge generation and teamwork can contribute to double-loop learning.
Proposition 8: Rewards based on good performance and effort can contribute to single-loop learning.

2.6.3 Training & mentoring

As a follow-up of performance appraisal, training can play an important role in bridging the gaps between what an organization knows and what an organization must know (Soliman & Spooner, 2000). The appraisal outcomes can be combined with other measures of evaluation to determine the

training needs in the organization. Such as, before new products or processes are introduced a series of training sessions are held to prepare employees for the change. This way the link will be formed between KM and organization strategy. Providing the training on company vision and mission has proved to direct KM activities to the right destination, serving the objectives of an organization (Yahya & Goh, 2002). But again, the question is - how can training be structured to facilitate generation of new knowledge which is so important for innovation in the company?

As was stated earlier implicit knowledge and experience that employees hold are very important resources of the organization which determines a long-term success. For innovative organization it is crucial that this knowledge is not lost and is utilized in a way that miscommunication and misunderstanding are timely avoided. Mentoring helps transfer tacit dimension of expert's knowledge, since it's the process when a novice observes the work of expert in person and acquires knowledge tacitly (Bryant, 2005; Swap, Leonard, Shields & Abrams, 2001). The cited authors mention that specific aspects of the job, some technical skills have been transferred through mentoring. Mentors can teach values, norms and organizational routines in an informal way. It's a way of active learning which has been proved to be crucial for the effectiveness of the learning process (Swap, Leonard, Shields & Abrams, 2001). Peer mentoring involves employees from the same lateral level when more experienced person teaches new knowledge and skills to the less experienced one (Bryant, 2005). The authors mention about the significance of mentoring since mentors possess the knowledge that has not been recorded in any database and is based on personal experience or tacit knowledge. Mentoring can be considered as an experiential learning, on the job training or learning by doing, these concepts are believed to be determinants of new knowledge creation; this is the process when knowledge is created through transformation of experience and embedded knowledge into the perceptions of the person (Lam, 1998; Nonaka, 1994). This type of learning is connected to explorative learning or double-loop learning (Shipton, West, Dawson, Birdi & Patterson, 2006). It has been argued that mentoring can be a tool for transferring tacit knowledge within employees (Swap, Leonard, Shields & Abrams, 2001). I've already explained the essence of tacit knowledge and its relevance to explorative innovation. Mentors can transfer the knowledge which can be beneficial for the existing tasks what employees try to accomplish (Swap, Leonard, Shields & Abrams, 2001). At the same time, they can observe the activities of mentors and through imitation and application of activities externalize that tacit knowledge (Nonaka, 1994). This is the process comparable with internalization pillar from Nonaka's SECI model when employee digests knowledge from experienced people trying to match it to his/her mental models and hence, create something different from existing practices.

The other advantage of this process, as the author states, is that since codified knowledge might become outdated with the rapidly changing environment of innovative organizations mentoring can facilitate transfer of up-to-date knowledge through the organization. Bryant (2005) also mentions that

mentoring is considered as an important source for learning. This process can support teams to be more effective since team members try to achieve common goals, thus, helping each other by training, socializing etc. Peer mentoring can turn tacit knowledge into explicit because they combine verbal forms of explanation with visual demonstrations. This personal contact is very important for new knowledge creation and sharing. Based on this, I can argue that mentoring can affect personalization strategy where tacit knowledge transfer becomes a central element. Ribiere & Roman (2006) researched that mentoring took a third place in the personalization strategy. Hence, frequent application of mentoring practice can stimulate the transfer of knowledge through personal communication. So when employees need certain knowledge and skills, they can apply to not only stored, codified information rather than mentors as sources of required knowledge.

Based on this, the following proposition can be formulated:

Proposition 9: mentoring can support personalization strategy.

Training programs focused on developing skills beyond existing job requirements might contribute to generalist knowledge development (Kang & Snell, 2009). If the on the job training is not limited to one position and incorporates experience from other positions as well an employee gets broader vision of the organization, this type of approach in training system facilitates creation of common ground in the enterprise. However, the structure of the organization can influence the possibility of learning on the job. For instance, companies which encourage team work provide more room for learning from each other, employees observe each other's activities and then transform acquired knowledge into own capabilities. For this purpose training can incorporate job rotation activity; however it can be defined separately as an HR practice. I will argue below that it is one of the influential tools for knowledge creation and supports innovation in the company. But training can also develop interpersonal skills and teamwork abilities in order to facilitate communication of employees within teams to create and share knowledge together (Lopez-Cabrales, Perez-Luno & Cabrera, 2009). Working in teams during the training with employees with different competencies can stimulate sharing of skills and knowledge. Proper training can directly influence the capability of employees to transform tacit knowledge into explicit and share it within organization. For instance, utilizing specific techniques during developmental programs such as observation, simulation and experimentation can strongly strengthen knowledge creation possibilities in the organization.

Trainings can have different purposes, among those, serving to develop general or specific skills of employees (Guidetti &Mazzanti, 2007). General trainings have been defined as an investment in human capital that can increase the productivity of employees at other employer to the same extent it increases at the employer who provides it (Loewenstein & Spletzer, 1999). On the other hand, the

authors describe the characteristics of specific trainings which are designed to increase the productivity of an employee only at the employer who provides it. Intensive training programs focused on improving current job-related skills might contribute to develop specialized knowledge and expertise (Bae & Lawler, 2000). While extensive training sessions designed to meet future skill requirements can increase general skills (Guthrie, 2001). Organizations seeking to differentiate their products on the market use thorough trainings (Bae & Lawler, 2000). Based on this, I can argue that specific skill development training can contribute to single-loop learning, while general skill development training can facilitate double-loop learning. The reasoning behind is that while providing intensive training sessions 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 sessions which can support development of skills out of their current occupation can stimulate employees question existing rules and develop divergent insights or competencies. It has been argued that mostly organizations do not finance general training since they're less profitable for the organization; general skilled employees can be easily pouched by other companies (Guidetti & Mazzanti, 2007; Hall & Soskice, 2001). The authors argue that specific skill developing trainings might be frequently financed by organizations while employee might be more willing to share expenses of general skill developing training. The rationale behind can be that this type of training can be more profitable for the employee in the long run.

Based on above arguments the following propositions can be formulated:

Proposition 10: training programs focused on improving existing job-related skills can contribute to single-loop learning.
Proposition 11: training programs focused on developing skills beyond existing job-related skills can contribute to double-loop learning.

2.6.4 Job rotation

Job rotation gives possibility to the employees to become familiar with the specificity of other positions that can improve the understanding of organizational characteristics and objectives. New ideas emerge when people are well aware about the organization, its products, production processes and the market (Mumford, 2000). While rotating on jobs employees establish trust and social contacts with other units of the organization. Thus, transferring of knowledge takes a broader spectrum. Employees acquire shared understanding, values and common vision (Lam, 1998). This way bridging firm-specific knowledge with organization strategy is facilitated.

Organizations use different forms of job rotation, 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. 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. It has been proved that informal job rotation supports development of unique practices and processes that can be very hard to be imitated by competitors (Krogh, Ichijo and Nonaka, 2000). Besides, it can support creation of overlaps or redundancy of information which is argued to be a prerequisite for knowledge creation (Nonaka, 1994).

Based on above literature review the following proposition can be formulated:

Proposition 12: job rotation between the same areas of specialization can contribute to single-loop learning and enrich experience of employees.

I can argue that shifting jobs between different areas of specialization can support double-loop learning and bring divergent insights from shared experiences. It is vital for innovative companies that employees possess extensive capabilities (Shipton, 2006). "Through project working, job rotation and visits to parties external to the organization, employees can achieve the attitudinal change required to question and challenge existing ways of operating" (Shipton, 2006, p.5). This will support creation of 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 & Foss, 2003, p. 256). In addition, job rotation can support broadening the firm specific knowledge and skills of an employee. It can help employees experience new responsibilities, learn new skills and link them with the previous tasks. It can facilitate getting a broader view on the company operation and understand the role of various structural units in this process. Consequently, this type of job rotation might be beneficial for generalist knowledge development and double-loop learning. When employees rotate to different positions which are divergent from their existing occupation and knowledge domains, they can acquire completely new understanding and question existing ones. Besides, bringing new experience to other knowledge domains will ensure the concept of *lack of shared experience*. So 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 I can formulate the following proposition:
Proposition 13: job rotation between different areas of specialization can facilitate double-loop learning and contribution to divergent experience.

Figure 2 and *3* show theoretical findings about the relationship between HR practices, KM and two types of innovation.

Figure 2. Theoretical findings - relationship between HR practices, KM channels and exploitative innovation

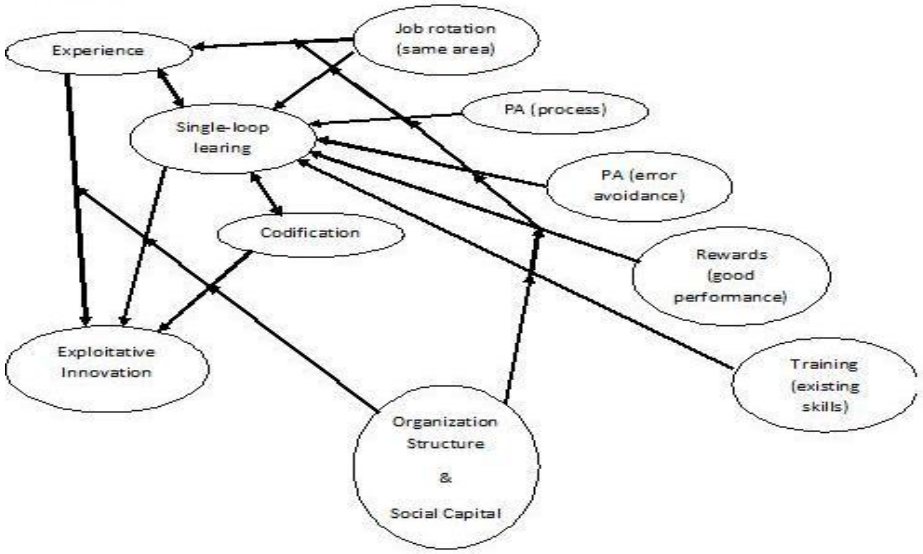
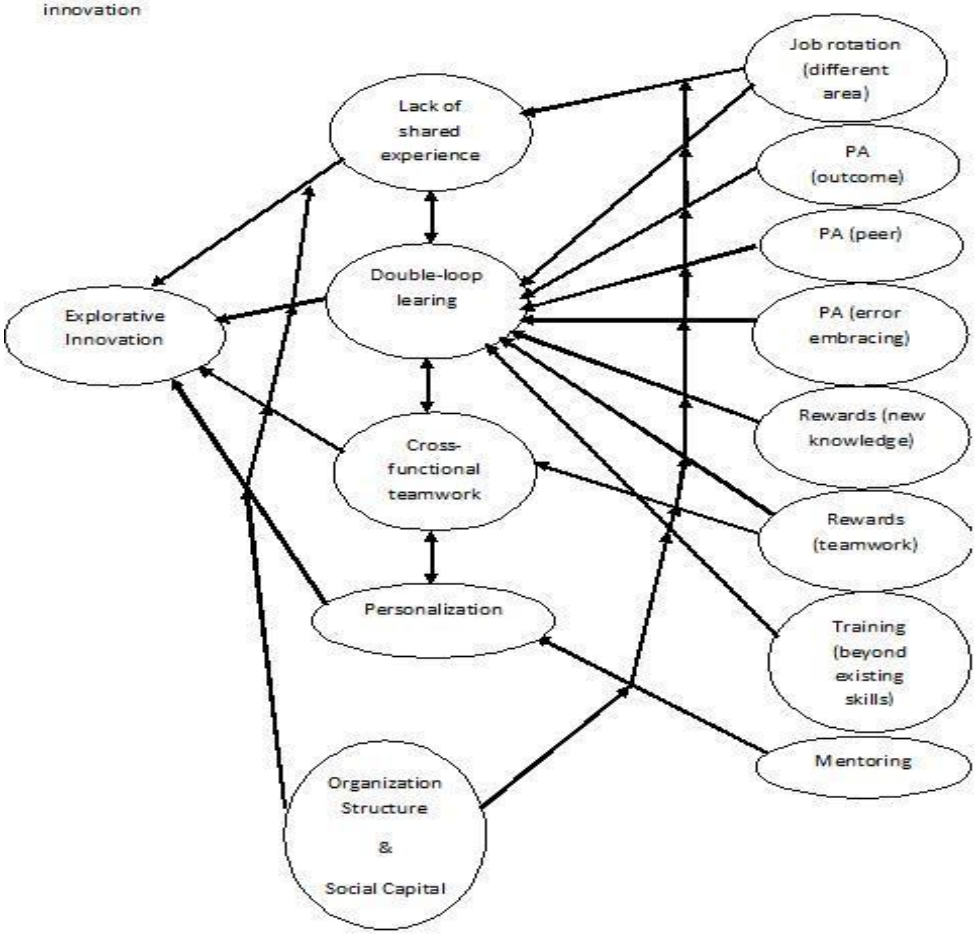


Figure 3. Theoretical findings - relationship between HR practices, KM channels and explorative innovation



2.7 Pre-conditions

Above discussion shows the relationship between three variables: human resource practices, knowledge management activities and innovation. I believe that the relationship between the variables can be circular and reciprocal. In other words, innovation can become an outcome as well as a source for introducing new HR practices for further knowledge development. On the other hand, KM can become the outcome of innovation rather than medium. Namely, keeping a report on lessons learned of innovative projects can contribute to new knowledge generation on a sound basis (Saenz, Arambu & Rivera, 2009). However it is the topic for further research.

It should be mentioned that whether pursuing either of the innovative strategies (explorative or exploitative) there should be a consistency between HR strategies in order to contribute to appropriate knowledge development. For instance, let's take radical innovation strategy and an HR practitioner with responsibility to create a platform for new knowledge generation. Number of actions could be encouraged, such as structuring on-the-job trainings, including peers and placing most focus on outcomes during appraisal, accepting failures, rewarding new idea suggestions, promoting creativity and delegating most of the responsibilities to the middle and lower level managers.

The circular relationship of variables can be impacted by various factors. However, it should be stated that KM is context dependent. In other words, every company is surrounded with the unique environment (Quintas, Lefrere & Jones, 1997). Hence, the necessary pre-conditions for KM activities will differ from company to company.

The application of relevant KM and HR practices coupled with appropriate pre-conditions can promote the performance of innovative companies. These pre-conditions can be: appropriate organization structure and social capital.

2.7.1 Organization structure

It has been argued that tacit knowledge can be better transferred through decentralized structure and informal coordination. On the other hand, effective application of coded knowledge requires more standardized and formal operations, hence more centralized structure (Lam A., 1998; Wiig K., 1997). Bottom-up management structure can promote self-management and autonomy; hence applicable HR practices will be utilized, such as informal appraisals and trainings, cross-functional teams as well as open communication and positive social atmosphere can be contributory. However, it cannot support combination of knowledge (Nonaka & Takeuchi, 1995), in other words, with bottom-up management the dissemination of knowledge, that can be in the ownership of management or other important divisions can become very hard. This type of structure can be linked to radical innovation. Nevertheless, hierarchal structure might be necessary to promote incremental innovation. Bureaucracy

might be beneficial to ensure effectiveness, quality and preciseness of information flow with high level of direction and low communication (Grant, 1996). Nevertheless, in knowledge intensive companies hierarchal structure cannot support personal interactions, informal environments for constant knowledge creation (Nurmi, 1998). In addition, rapidly changing market demands require overlapping of processes or simultaneous implementation for rapid product development and introduction to the market (Grant, 1996). This process needs high speed of knowledge integration which requires active communication, less bureaucracy and this can lead to explorative innovation. Departmentalization or centralization might inhibit adaptation of organization to marketplace and environmental changes (Kohli & Jaworski, 1990). The authors argue that organization structure can influence its market orientation. It is interesting to mention one notion from these authors. They state that formalization and centralization in organization structure can inversely influence knowledge generation and dissemination but positively affect implementation or responsiveness stages. This proposition interestingly connects organization structure to the effectiveness of KM channels.

Another model called ***middle-up-down management*** combines the essential attributes of both previously mentioned structures that can promote knowledge creation and effective management of organization for both explorative and exploitative units. The essence of this structure lies in the meaning that middle managers can be curriers between top and bottom parts of organizational structure. They operate both on vertical and horizontal levels. On the one hand, they can absorb broad vision of top management, adjust it to more realistic principles and communicate to lower structural units. “They work as a bridge between the visionary ideals of the top and often the chaotic reality of the frontline of business” (Nonaka, 1994, p.32). This model is comparable with ***T-shaped management*** structure, which strives to balance knowledge sharing horizontally and vertically (Hansen & Oetinger, 2001). It has the same logic as T-shaped skills, mentioned earlier. This type of structure can be applied to ambidextrous organizations. This structure provides a balance between chaotic and stable environments which is characteristic for dual organizations.

2.7.2 Social capital

Another aspect that can be considered as a pre-condition for ensuring the relationship between HR practices, KM and innovation can be social capital (SC). It has been defined “as an asset that inheres in social relations and networks” (Leana & van Buren, 1999). Social capital has been argued to be an important mechanism for knowledge exchange and combination in organizations (Kang & Snell, 2009). In recent studies on social capital focus has been placed on three key dimensions: structure, affect and cognition (Adler & Kwon, 2002; Kang, Morris & Snell, 2007; Nahapiet & Ghoshal, 1998). As the authors argue, structural dimension is about network configurations or pattern of connections among individuals. Affective dimension refers to the relational aspects of interpersonal communication, such as trust, motives etc. And cognitive dimension addresses shared systems of

meaning and understanding among individuals. In this study I will combine the basic characteristics of social capital in two elements: (a) social relations and (b) trust. The first is relevant with the content of structural dimension (Adler & Kwon, 2002) and cognitive dimension (Kang, Morris & Snell, 2007) of SC and the latter is addressing affective dimension. To explain in more detail the connection of social relations with the relevant dimensions, should be stated that interactions of employees create different patterns of networks, dense or loose. On the other hand, they facilitate building shared understanding in the organization. Social relations, as was described above, have a central place in the whole structure of social capital. Sometimes they're used interchangeably for the entire construct of SC (Kang, Morris & Snell, 2007; Nahapiet & Ghoshal, 1998). But above explanation shows that social relations in combination with the impact of trust create a cohesive picture of SC. In other words, social relations facilitate creation of networks (structural dimension) and building of shared understanding (cognitive dimension), but is affected by trust (affective dimension) to enhance the value of relationships (Kang, Morris & Snell, 2007). This way reciprocal relationship is established as well, existence of networks and shared understanding can boost the level of trust among employees.

I believe that social relations and trust might strengthen the link between appropriate HR practices, KM and innovation. I will discuss below the importance of these two components.

a. *Social relations*

Social relations can be more effective in sharing both tacit and explicit knowledge than information or formal control systems (Kang, Morris & Snell, 2007). Positive social relations facilitate creation of common identity and collective interpretation of reality (Dhanaraj, Lyles, Steensma & Tihanyi, 2004). They can foster shared values, beliefs and vision. This notion is directly connected to transfer of tacit knowledge, generation of new ideas, reflection on other's mistakes etc. Dhanaraj et al. (2004) argue that shared values and systems enhance the transfer of tacit knowledge. They state that for tacit knowledge to be exchanged, there need to be close relationships between the people sharing knowledge. Socialization might be beneficial for new employees to acquire critical information that can facilitate their performance (Bryant, 2005).

Social interaction helps people understand how actually employees use knowledge at work. It has been tested that essential knowledge is often passed between people by gossip, stories and observation of each other's work (Pfeffer & Sutton, 1999). In other words, social relations can facilitate informal learning. This is mostly applicable to explorative innovation where structure is chaotic, flexible and informal. Social culture helps formulate strong teams, which can itself support coordination and fast acquisition of required non-redundant information (Hansen, 1999). On the other hand, frequent interactions can promote generation of redundant information, which can enhance specialist knowledge and single-loop learning.

Social relations can have different configurations in order to affect a component of knowledge creation – learning. For instance, it has been argued that dense networks (structural dimension) can facilitate exploitative learning while sparse networks can enhance explorative learning (Kang, Morris & Snell, 2007). As the authors argue, the reasoning lies in the argument that strong and dense networks can ensure the transfer of in depth knowledge which is characteristic for exploitative learning. Whereas, weak and non-redundant networks enable employees acquire new knowledge and ensure explorative learning. In addition, shared understanding (cognitive dimension) can have different combinations to affect different types of learning. For instance, understanding how knowledge can be combined into a whole can benefit exploitative learning. On the other hand, common component knowledge facilitates interpretation of new knowledge and can support explorative learning (Kang, Morris & Snell, 2007). As the authors state, the argument behind lies in the fact that understanding the relation of their knowledge to the whole can help employees to absorb the deep knowledge of their *relational partners*. On the other hand, having common component knowledge facilitates understanding of new knowledge rather that its absence.

Socially embedded relations in the organization can foster the development of HR practices which are based on achieving collective goals and stable job tenure (Leana & van Buren, 1999). As the authors argue, it can be more beneficial for organizations to have HR practices based on teamwork than those practices based on exclusively individual contributions. For instance, group reward systems, appraisal or team-based trainings can be outcomes of strong social relations as well as facilitators of achieving better organizational advantage.

Since the focus of this research is not on understanding dimensional influence of SC on the links between research variables, the concentration of this study will be placed on the general affect of SC on the relationships between HR, KM and innovation.

b. *Trust*

As stated above, trust has been presented as one of the components of social capital. “Trust can be defined as reciprocal faith in each other in terms of intention and behaviors” (Lee & Choi, 2003, p.190). Research shows that trust encourages tacit knowledge transfer (Dhanaraj, Lyles, Steensma & Tihanyi, 2004). It is tightly connected with the willingness of employees to create and share knowledge. It can enhance the cooperation and sharing of knowledge in the informal settings (Barol & Srivastava, 2002). On the other hand, informality can increase inducement of innovation (Madhavan & Grover, 1998). It lessens the concern about the misuse of information (Argote, McEvily & Reagans, 2003; Bukowitz & Williams, 2001; Soliman & Spooner, 2000). It’s a mutual process, trust is formed during sharing of experience and on the contrary, without trust knowledge sharing weakens (Nonaka,

1994). Besides, it can be a supportive factor in cross-functional teams to work towards team goals (Madhavan & Grover, 1998).

Relevant HR practices can support formulation of trust. For instance, job rotation is believed to increase the level of trust (Lam, 1998) since employees develop social ties with other employees while rotating between various positions. Rewarding might also contribute to building of trust and this way promoting sharing of knowledge. On the other hand, trusted employees are more inclined to conform to HR practices in order to create new knowledge and contribute to organizational strategy. I can assume that time can play a role in stimulating building of trust. The more and frequent interaction you have with another employee the more you know the person and sharing of information becomes easier. Besides, the attitude of management can crucially influence the level of trust between employees and management. Acknowledging personal occurrences, such as birthdays, also rewarding accomplishments might positively contribute to the psychological contract of employee, thus enhancing trust. Thus, trust can enhance the relationship between HR, KM and organizational strategy.

Two types of trust have been differentiated: generalized and resilient dyadic (Kang, Morris & Snell, 2007). As the authors argue generalized trust is expressed to others because they're members of the same social unit. Resilient dyadic trust appears between two parties who have a direct experience with each other. They can have a distinct affects on knowledge creation. For instance, researchers argue that generalized trust can be contributory to exploitative learning, while resilient dyadic trust can facilitate development of explorative learning (Kang, Morris & Snell, 2007). According to authors the reasoning behind this is in the fact that during exploitative learning the members need to behave as a cohesive unit in order to share a deep knowledge. Generalized trust can facilitate this process since it does not require a personal experience with every member of the network. It's more based on norms, rules and expectations of the group. On the other hand, resilient dyadic trust, as said, is developed between specific parties, so it doesn't require searching for unrelated relationships, and support knowledge exchange without that effort. It needs less endeavor to build and narrow commitment to maintain. It is limited in duration of relationship and thus hampers exchange of deep, specialized knowledge. Hence, it can be assumed that it is more contributory for explorative learning.

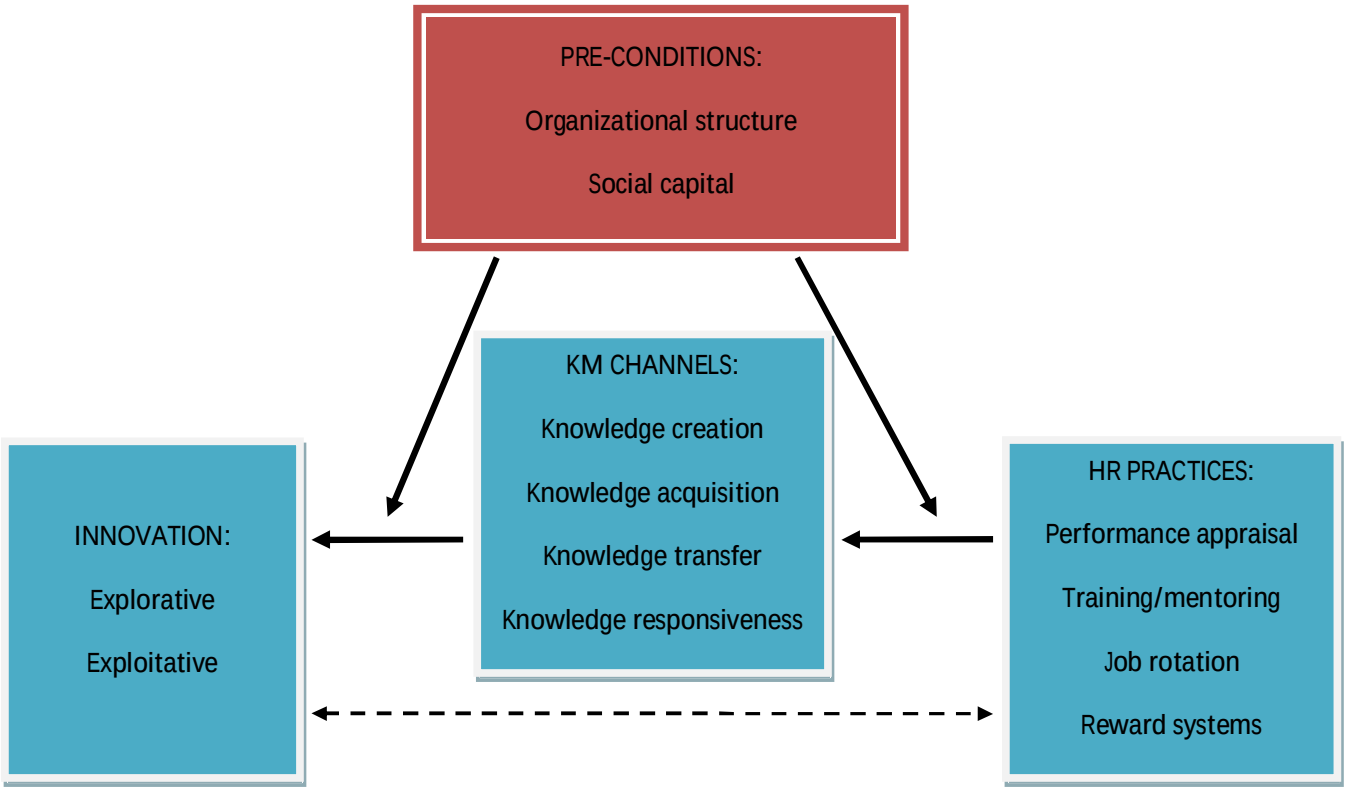
As was described above, there is a tight connection between the components of social capital and research variables. In addition to this, I can argue that social capital can be connected to organization structure as well. Many ties in the organization are based on formal structure and are not voluntarily chosen (Adler & Kwon, 2002). As the authors argue there is no consensus on the type of structure that can be beneficial for social capital. There have been more assertions on the fact that the hierarchy has a destructive affect on social capital, as well as bureaucracy on informal organizations. It is beyond of

the scope of this research to explore the link between SC and organization structure, but it's interesting to see the need for the further research here.

Based on the literature review the final proposition can be stated:

Proposition 14: organization structure and social capital can affect the relationship between HR practices, KM and innovation.

Research model



This research model depicts the sequence of relationships that should be investigated whether HR practices can contribute to KM in creating knowledge to support different types of innovations in the company. One-point arrows show this relationship. On the other hand, two-point dashed arrows depict reciprocal relationship that could be formed between types of innovation and HR practices. The investigation of this link is not the goal of this research; however logical assumption is that HR practices can be directly related to types of innovation whereas exploratory and exploitative innovation can become antecedents for generating new HR practices. Through this model it is also argued that one-point arrow links can be affected by the existence of pre-conditions.

3. RESEARCH METHODOLOGY

3.1 Unit of analysis

In order to collect a data, I used a criterion-based selection (cf. LeCompte & Preisse, 1993). Eight 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 my study I used as a criterion the *need* for innovation, rather than merely innovative organizations. As stated in the literature review, 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 (industrial and service organizations). Out of eight organizations, six were profit and two non-profit companies. In addition to industry, organization size (in terms of number of employees) differed as well. The range was from 150 up-to 3500 employees. The respondents were chosen from 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 of July-August 2009.

3.2 Method and instrument

I 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 the 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. All of the participants agreed. Nevertheless, interviewees were allowed to use their native language if problems with explanations arose during the interview. With the permission of respondents each interview was recorded and transcribed. The detailed transcriptions were sent to all companies for their confirmation or comments to eliminate misunderstanding and for further reference during 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) I ensured reliability by using the 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 requested to describe main features of them. Other questions referred to the priorities of companies 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 (interview protocol is attached in Appendix A).

Interviews were followed with detailed questionnaires. Participants were given the freedom to fill them out in collaboration with other employees. Four companies noted the involvement of their colleagues from HR department in completing questionnaires. For this research, a questionnaire was structured in a way to measure the existence of KM constructs, two types of innovation (explorative and exploitative) and HR practices (performance appraisal, training, job rotation and reward systems). The 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 study, using unique constructs. For the assessment of the 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 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.
Detailed measurement model is presented in Appendix B.

4. DATA ANALYSIS

The purpose of this paper was to investigate how and if different configurations or practices of knowledge management and human resource management can be related to the two distinct types of innovation. It should be mentioned firstly, that out of eight participating companies only six returned filled-out questionnaires. Hence, the analysis will be based on the results from six companies, nevertheless interview materials from all companies will be considered. When presenting the empirical part I will present general findings followed with the results about innovation, KM and HR practices.

4.1 General findings

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, 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 to see the differences in findings between these two sectors.

4.2 Innovation

According to the results on innovation, the first striking finding 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. Except for one company, all participants perceived their innovative performance as good with the awareness of further need for improvement. But there was no priority for any type of innovation. 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 were asked about the problems they faced throughout the innovation process. Common answers (summation from all companies) were congruent to the literature on innovation. They referred to different levels, such as governmental level, organizational level and individual level. On the governmental level organizations stated that European restrictions and environmental aspects did have an impact on the room of maneuver for radical innovation. On

organizational level, the structure of the organization was seen as a major problem for the companies. Moreover, there is often a lack of time, money and especially knowledge for radical innovation. Additionally, frequent interactions with customers and frequent changing demands were 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.

4.3 Knowledge management

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 broadly educated in comparison with 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".

Knowledge management activities were present in all companies and were considered as valuable. But considering two sectors of companies certain trends can be noticed there. In both sectors creation of knowledge was an established activity. However, one clear difference was found in terms of special tactics designed for promoting new idea suggestions (e.g. idea boxes) which was higher in industrial sector. Considering three features of knowledge creation process, such as learning, teamwork and experience certain tendencies are apparent. Often knowledge creation process was connected to cross-functional teamwork and learning. For instance, one of the participants mentioned:

> "I think the most important way to learn is to come together."

Another stated:

> "When there is a new product, new process…team is created…we use techniques, like brainstorming. That is often used when there is a new customer, new product or a major change in the product".

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 was assigned to a certain project. Even though, the interviews showed that team-work and

project orientation were a fundamental part of the organizations, the questionnaire data did not support this claim. Respondents from the industrial companies gave overall neutral responses (three on a five point Likert scale) on team work orientation and the service sector was found to be slightly higher than neutral. Overall, utilization of formal meetings and cross-functional teams to brainstorm together in order to develop new ideas or work on problem solving issues was on low level in both sectors.

Creation of learning environment for new knowledge generation was much higher at service sector. Firm-specific experience was high in both sectors, but still slightly higher in service sector.

Most of the companies in both sectors linked knowledge creation and transfer to the training process. For instance, when asked about their opinion how organization deals with knowledge exchange, one respondent answered:

> "Yes, e.g. R&D employees give training to our sales department".

I will elaborate later about the types of training used in most of the companies. Some organizations mentioned about the importance of flexibility, autonomy, involvement and empowerment of employees to explore themselves and learn from each other. Other companies linked performance appraisal to the process of knowledge sharing. In order to gap the knowledge requirements and actual availability, in order to plan future knowledge improvements these organizations considered performance appraisals as decisive instruments for accomplishing mentioned purposes.

On general level, knowledge acquisition was present in the companies of 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. On the other hand, obtaining information about competitors is higher in service sector.

Knowledge sharing activities are quite well established in most of the companies. Personalization was more established than codification strategy within companies. In service sector knowledge dissemination was higher than in industrial sector. Further, personalization strategy was more utilized

in service sector. For storing codified knowledge most of them used databases, intranet, knowledge repositories and written documents. Methods for personalized communication were mentioned to be meetings, informal knowledge sharing tactics, face-to-face communication and coaching or mentoring. In addition, most of them used ICT tools to ensure personalized relationships, 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 were higher in industrial sector.

Mostly the speed of responding to knowledge requirements was quite high in most of the companies. However, it's interesting to note that responding to customer needs rather than meeting employee concerns was 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 was the level of responding to technological developments in service sector. In addition, acquisition of competitor information was higher in service sector. It is interesting to note that responding rapidly to this information was higher as well in the same sector compared to industrial sector.

4.4 HR practices

When talking about HR-practices I found that some of them were either not explicit or formalized. For instance, mostly job rotation and reward systems were not formalized in companies. In majority of the organizations no explicit HR practices were present 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: job rotation and training. 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 with teamwork, involvement in projects or developmental programs, such as traineeships where employees move from one position to another during several years. For instance, on the question whether job rotation was present in the company one of the 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 activity 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. In most of the companies on-the-job training and mentoring were common practices as well. However it is notable that in service sector it was a widely more established practice in contrast to the industrial sector. It's interesting to remark that mentoring was mentioned a number of times to be used as a tool to maintain knowledge, when a senior worker passes knowledge to the junior employee.

Performance appraisal 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 is also interesting to see that errors were 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".

Both types of appraisal (error avoiding and error embracing) were higher in service sector compared to the industrial 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.

The majority of answers regarding the value of the HR practices were related to reward systems. Most of them rated them as less important practices:

> "I think that in general the important ones are the ones that really internally, intrinsically motivate the employee. And a reward system does not internally motivate the employees".

In certain organizations even though reward systems were not formalized non-financial incentives were used, such as career movement, employee development, exposure to articles (the ones who do a research). It became obvious that rewards were not focused on promoting new idea generation or teamwork; they were mostly designed to stimulate good performance and effort. It was apparent that industrial sector paid more attention to rewards in this respect.

4.5 Pre-conditions

Organization structure

Both, top-down and bottom-up structure was weakly present in most of the companies. However, industrial sector showed to be inclined to more top-down structure and conversely service sector tended to use more bottom-up approach. In addition, middle level managers were slightly more actively involved in information exchange at service sector.

Social capital

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 was even 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. There was no difference found between the sectors.

Positive social relationships were present on the same level in both sectors. Nevertheless, it's notable to mention that the informal working environment was stated to be rather high in both sectors.
For the summary of empirical findings *Table III* depicts major results.

Table III. Empirical findings according sectors

	Industrial	**Service**
INNOVATION		
Exploitative innovation	*	*
HUMAN CAPITAL		
General skills	*	
KNOWLEDGE MANAGEMNENT		
Knowledge creation	*	*
• Special tactics ('idea box')	*	

• Learning environment for new idea generation		*
• Firm-experience		*
Knowledge acquisition	*	*
• External source (customers)	*	
• External source (competitors)		*
Knowledge transfer		*
• Personalization		*
• Sharing knowledge with external agents though personalization	*	
Knowledge responsiveness	*	*
• Responding to external sources (customers)	*	
• Responding to external sources (competitors)		*
• Responding to technological developments		*
HR PRACTICES		
• Job rotation	*	
• Training for skills	*	
• Mentoring		*
• PA (results & process)		*
• PA (error avoidance & error embracing)		*
• Peer feedback		*
• Rewards for good performance and effort	*	
ORG STRUCTURE		
• Top-down	*	
• Bottom-up		*
• Middle managers		*
SOCIAL CAPITAL		
• Trust	*	*
• Positive social relationship	*	*

5. DISCUSSION

The objective of this research was to bring KM and HR flows at the intersection of innovation. Until now a lot of previous studies covered this topic by combining either of the variables. This research, as known, took one more step further by bringing specific aspects of KM, HR flow and innovation trying to find sub-links between them. Hence, KM channels were related with two types of innovation, and with four individual HR practices. More specifically, KM channels were investigated as outcomes of HR practices and antecedents of innovation.

In this section I will go back to the research propositions that I stated in the theoretical framework in order to analyze their bearing on empirical findings. It should be stated that this study is exploratory, trying to capture the basis of the relationships between research variables and common trends within the companies. 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 can imply to the fact that this strategy might not be the primary goal of these organizations. HR managers were often found not to be fully aware of the concept of innovation and also had no priority on certain types of innovation. Contradictory, all except one participant stated that innovation was important for them and that their innovative performance was 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.

In the data analysis part I have mentioned that there was a contradiction between interview and questionnaire findings. While considering it as a limitation of this study it can be assumed that the contradiction derives from the gap between the aspiration of management and a real picture in the company (since mostly questionnaires were filled out by additional staff rather than only an HR Director/Manager).

As another general remark about the findings, sometimes I noticed that there was a disparity in the understanding of basic notions. For instance, for one company knowledge creation was associated with generation of completely new ideas to the world. Another organization defined innovation as a multifaceted construct and found it difficult to differentiate between only two types. They mentioned that one can achieve exploitative innovation on a product level but achieve explorative innovation on a sub-product level.

Before discussing major findings in KM constructs attention should be paid to the types of human capital and innovation. It is difficult to indicate a clear relationship between the types of skills and innovation since I found that generalist human capital and exploitative innovation were dominant in

the majority of companies. This is contradictory to earlier mentioned theoretical arguments by Kang & Snell (2009) and Hall & Soskice (2001) who related broad skills and knowledge to exploration and specific skills and knowledge to exploitation. To state in a different way, it was found that mostly general skills existed in the context of incremental innovation. Further, since I connected single-loop learning with specialist skill holders it can be argued that the first is not a contributor to exploitative innovation either. However, there is one clear finding that goes to my conceptualization, that firm-specific experience can be beneficial for exploitative innovation since the results showed that the number of years employees stayed at companies was quite high. This finding is even more strengthened at service sector. Hence, to go back to Proposition 1 (**P1**) (s*ingle-loop learning and experience can support exploitative innovation)* it is **partially supported** by empirical findings. What does this mean? It means that employees are more inclined to stay in organizations for a longer period and acquire firm-specific experience; this knowledge helps them make improvements in existing norms, routines and processes. And thus, contribute to exploitative innovation. According to the theoretical framework employees with long experience should be able to develop in-depth knowledge in specific domains, however empirical part shows that still general skills are dominant in companies. I can assume that the results might be derived from different understanding about the notions which was mentioned earlier. For instance, specialist knowledge at one sight might be associated with higher level of expertise, characteristic for high hierarchal levels. Nevertheless, in my understanding specialist knowledge can be located at any level of hierarchy. So this issue goes back to the above mentioned gaps in understanding of notions and should be dealt by future researchers.

Brainstorming on new ideas in teams, or cross-functional teamwork and thus, contribution to lack of shared experience was low. This means that input from various experiences is not established. This finding opens one logic – as it was described above explorative innovation was less introduced in either of the sectors, this goes in line with the findings in the theoretical part that the absence of mentioned practices can hinder explorative innovation (Gupta & Singhal, 1993; Majchrzak, Cooper & Neece, 2004). In the literature review I connected the ability of divergence and lack of shared experience with general skill holders. In the empirical part, it is obvious that even though most of the employees are equipped with general skills they are not provided with the opportunity to bring divergent ideas in a group. And thus explorative innovation is not supported.

Learning environment promoting new idea generation was high in both sectors. At the same time, I've already mentioned that general skills were dominant in both sectors as well. This implies to the fact that double-loop learning can be present in organizations but this might not contribute to explorative innovation. In terms of sectors, it's difficult to group findings there for the interest of this research. Results show 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. Since the

lack of shared experience and cross-functional teamwork were not ensured but double-loop learning might be present at the companies I can state that P2 (*double-loop learning, lack of shared experience and cross-functional teamwork can support explorative innovation*) was **not supported**. What can this finding say? This can imply to the fact that even though employees can have a potential to search for novel ideas (tendency for double-loop learning and general skills) their endeavors may not be supported by management instruments, such as cross-functional teamwork. And thus, this hampers the contribution to explorative innovation.

Regarding knowledge dissemination, a clear trend is vivid. In service sector both types of strategies were more introduced rather than in industrial sector. However, personalization strategy dominated compared to codification strategy. What is the value of this finding? In theoretical constructs I've connected personalization strategy with explorative innovation. However, empirical part shows that it is not very much linked to that. It's clear that storytelling, best practices and/or lessons learned collection and diffusion is quite high in service sector. These practices were conceptualized to be contributory to explorative innovation; however findings do not support this notion. Codified knowledge is also utilized but on a lower level compared to the clear preference for personalized communication. Hence, **P3** (c*odification strategy can support exploitative innovation)* and **P4** (p*ersonalization strategy can support explorative innovation)* are **not supported** by these findings. The dominance of personalization strategy can be partly explained by another earlier stated finding - the high number of years employees stay in organizations. One of the participants from industrial sector stated:

> "…everybody knows everyone. They came together learning a job for forty years. So I think there are very close relations between the employees. It's a very informal company."

So, from this quotation it becomes clear that the number of years of experience within firms can be contributory for more personalized relationships. Based on this, I assume that personalization strategy might become an outcome of employee attitude and willingness to stay longer in the company rather than a management policy.

As was discussed above knowledge creation and dissemination instruments were established in both sectors. Acquisition and responsiveness were well introduced as well. However, it is interesting to note that acquisition of information from external sources was as high as responding to them. In the theoretical analysis it was mentioned that explorative innovation is achieved by utilizing external knowledge, while exploitative innovation is based on inside knowledge resided within the firm (Kang & Snell, 2009). This finding again contradicts with the mentioned assumptions by authors. According to findings, companies place more focus on acquiring and responding to external knowledge sources.

This should theoretically support more explorative innovation, but the opposite is noticed - exploitative innovation is more established in most of the companies.

To discuss HR practices and their relationship with KM, let's start with those practices that were mentioned to be important for innovation, such as job rotation and training. The implementation of job rotation was very low in companies and there was no clear distinction between the two types whether employees were rotated between different areas of specialization or within one area of specialization. Only one company showed preference for rotating employees between other areas of specialization. Hence, I cannot argue anything in relation to the different KM configurations. Job rotation seems to be one of the biggest challenges for organizations since as stated already it was identified as a valuable practice for companies but difficult to implement due to various reasons. One of the causes was the resistance of employees to change their long established relationships with their supervisors and move to another position. Based on this, **P12** (*job rotation between the same areas of specialization can contribute to single-loop learning and enrich experience of employees)* and **P13** (*job rotation between different areas of specialization can facilitate double-loop learning and contribution to divergent experience)* **cannot be supported** by the empirical data.

With regard to training a clear distinction is noticed but no evident relationships to the different configurations of KM and types of innovation. There is an apparent tendency for the training to improve existing skills rather than skills beyond their existing job requirements. Earlier I've stated about the contradictory finding that single-loop learning and specialist human capital were low but exploitative innovation was high. The existence of the training program 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. Hence, **P10** (*training programs focused on improving current job-related skills can contribute to single-loop learning)* and **P11** (*training programs focused on developing skills beyond current job-related skills can contribute to double-loop learning)* **cannot be supported**. This finding implies that the HR practice contributes to innovation directly, without moderators in terms of learning.

The research data showed that personalization strategy was dominant compared to codification strategy. Further, the findings indicated that mentoring was an established practice. In one of the companies from industrial sector knowledge transfer activities were directly related to mentoring and coaching:

> "…we make sure that we drain their brains of all the knowledge they have and transfer this knowledge to other people. So it is crucial for our company, we created special mentor men teams, specifically in those areas where knowledge development and knowledge transfer is crucial".

As it was elaborated in theoretical constructs, mentoring can be a tool to pass tacit knowledge and up-to-date information (Bryant, 2005; Swap, Leonard, Shields & Abrams, 2001). On the other hand, frequent application of mentoring practice can stimulate the transfer of knowledge through personal communication (Ribiere & Roman, 2006). Since the findings show that both mentoring and personalization strategy were established practices I assume that mentoring can become a stimulator of personalized knowledge exchange. Thus, **P9** (m*entoring can support personalization strategy*) **can be supported**. What is the essence of this finding? According to earlier results personalization strategy was not able to support explorative innovation. This means that even though employees prioritize face-to-face communication and are facilitated by mentoring this does not directly encourage explorative innovation. Of course personalization strategy in itself is not a mere method to guarantee creation of new ideas, however it can play a supporting and facilitating role for creation of an atmosphere where the generation of new concepts can be stimulated. What does it say in this case? The relevant atmosphere is established (through personalization strategy), supported by mentoring but introduction of drastic ideas does not take place, conversely minor adjustments or improvements of processes or products are dominant.

In relation to performance appraisal there is no clear picture on the links between different types of appraisal, configurations of KM and innovation. I found that result based appraisal was preferred in contrast to process based appraisal. Result based appraisal is a practice which is theoretically linked to the development of double loop learning and in turn explorative innovation. Empirically I found that there may be the above mentioned relationship between result based appraisal and double loop learning but the final link to explorative 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 avoiding appraisal may be directly linked to exploitative innovation and not through single-loop learning. In addition, including peers in evaluation process was also low on general level. Hence, since teamwork is also weakly introduced in most of the companies peer evaluation is not valued either. Based on this, **P5** (*performance appraisal based on process evaluation and error avoidance might support single-loop learning)* **is not supported**, while **P6** (*performance appraisal focused on evaluating performance outcomes, including peer feedback and error-embracing practice might support double-loop learning)* is **partially supported** where only result based PA is linked with double-loop learning. Let's discuss in more detail the value of this finding. In literature review I've noted about the essence of result-based appraisal and argued that it can stimulate employees to diverge from existing knowledge domains in order to generate new knowledge. The findings show one logical link. Appraising employees based on their achieved outcomes rather than the process of accomplishing those results can be an indicator of the existence of general skills and the potential for double-loop learning. On the other hand, the results also show that errors are not tolerated during appraisals. According to theoretical analysis these are two contrasting findings. It means that while evaluators

disregard appraising specific steps they still do not allow making errors during the performance. How can employees be free to achieve results? How can they risk trying new things with the fear to avoid mistakes? Hence, I can argue that implicitly the focus might still be on process evaluation which is characteristic for exploitative innovation.

Reward systems as stated was least preferable HR practice. Nevertheless, a clear tendency is noticed for giving incentives to employees for good performance and effort rather than for generating new knowledge or for good teamwork. This again leads to the argument that certain HR practices can have a direct affect on innovation without passing through KM channels. Hence, **P7** (*rewards based on new knowledge generation and teamwork can contribute to double-loop learning)* and **P8** (*rewards based on good performance and effort can contribute to single-loop learning)* **are not supported**.

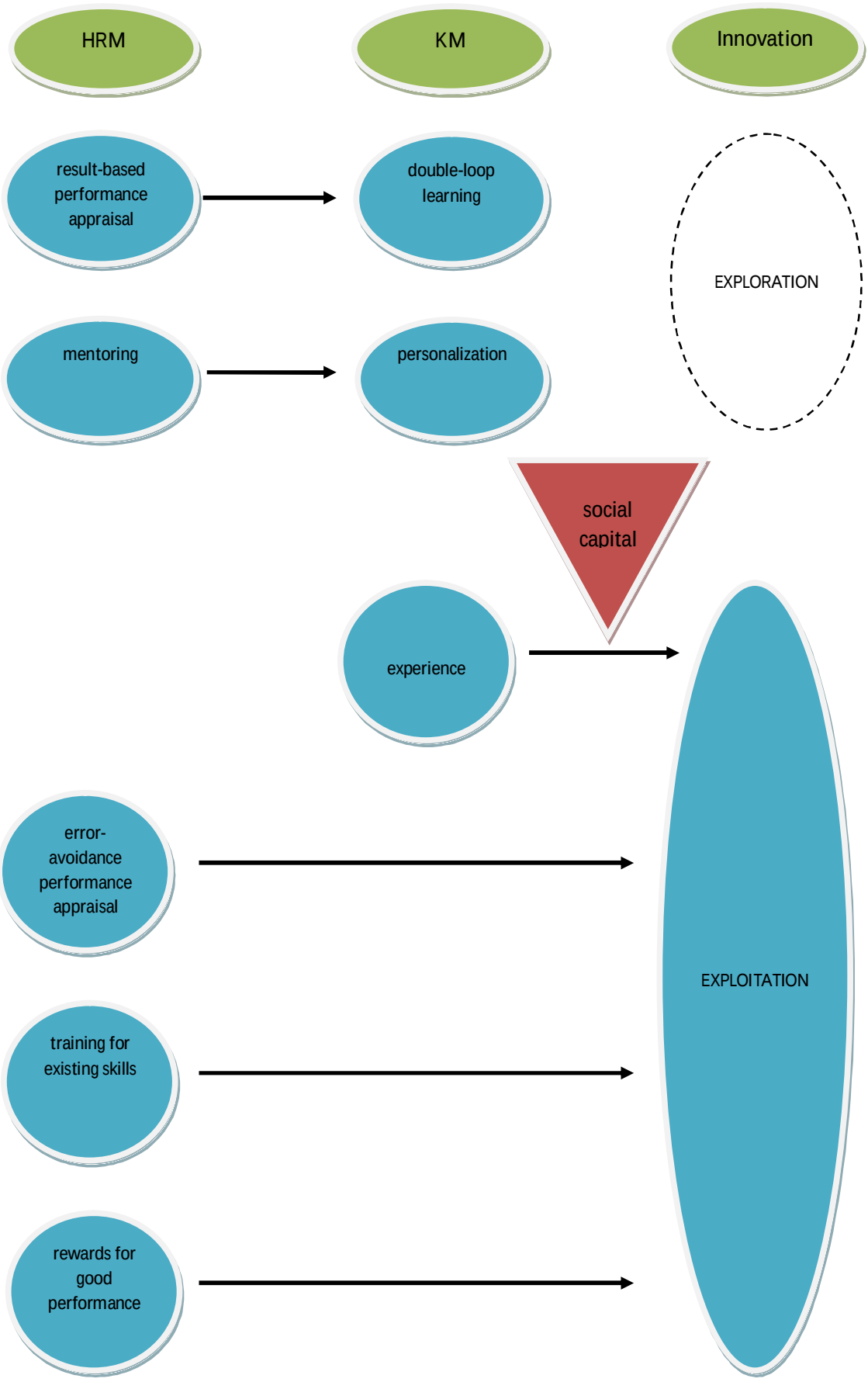
To discuss pre-conditions, it should be stated that the findings didn't show a clear preference for either of the organizational structure (top-down and bottom-up). Most of the answers are around the neutral (around three on five point Likert scale). The role of middle level managers is not strong either. This places a difficulty to argue about the role of structure on the relationships between HR, KM and innovation.

I can argue that social capital (SC) is relatively established in most of the companies. In the theoretical constructs I defined SC in terms of social relations and trust. To discuss the findings in relevance to each of the component let's start with the first. Social relations for majority of companies (in four organizations out of six) are quite positive and warm. Employees help each other to achieve an overall objective. Particularly, informal environment is quite high in all companies. That is an interesting finding. In the literature review I stated that informal environment can strengthen sharing of knowledge, especially tacit knowledge. High level of informal interaction supports the previous finding about the dominance of personalization strategy since as argued the first creates the atmosphere where personal relationships become easier to establish. To discuss the second component of SC it should be stated that questionnaire findings show the existence of trust on higher than neutral level. It was very difficult for participants to explicitly claim its presence on a high level due to its multifaceted, intangible and subjective nature. Further, the findings show that acquisition of knowledge from internal sources was less established. It can be assumed that there is a lack of information about employee attitudes. With the absence of this data the level of trust is hard to measure in the companies. In addition, as I argued earlier, time can play a role in formulating trust. I've found that majority of employees have been employed at the companies for a number of years. Adding to this picture high level of informal environment and more personal interactions, I can argue that social capital is moderately established in most of the companies.

To sum up the discussion about the effect of pre-conditions, it's hard to state about the impact of organization structure on research variables due to ambiguous results. Since it is out of the scope of this paper to discuss specific affects of SC on different channels of KM, my analysis is more general in this case. As stated in literature review, socially embedded relations in the organization can foster the development of HR practices which are based on achieving collective goals and stable job tenure (Leana & van Buren, 1999). One of the findings showed that teamwork was weakly established practice in most of the companies. Majority of organizations indicated that employees were not very much enthusiastic to subordinate their own goals to the goals of organization. This implies to the fact that collective mentality is not common in companies and team-based HR practices are not introduced. I can assume that the impact of SC on the relationship between HR practices and KM is weak. On the other hand, the impact of SC on the relationship between KM and innovation might be stronger. The argument is that with the existence of moderate SC, KM channels are present to the relatively moderate level as well. Researchers state that "much of the organizational learning takes place in the context of social interaction" (Kang, Morris & Snell, 2007, p.238). As the results showed learning environment for generation of new knowledge was high and explorative learning was more established. At the same time social relations and informal environment were on high level. Based on this, I can assume that the impact of SC can be stronger on the link between KM and innovation. Hence, **P14** (o*rganization structure and social capital can affect the relationship between HR practices, KM and innovation*) can be said to be **partially supported**.

Irrespective of the general picture that most of the propositions are difficult to support with empirical findings, the results can still be interesting and new for the scientific world. Figure 4 below shows empirically found links.

Figure 4. Empirically found relationships



6. CONCLUSION

To conclude this study I will first explain major discussion points, will go back to the research model and at the end I will try to answer the central question. While coming up with major conclusions, a number of questions will be raised that can be valuable for future studies.

The following major conclusions can be listed:

- Lack of clear strategy on innovation may leave important resources unutilized;
- Certain types of KM channels and HR practices exist in the framework of exploitative innovation, while theoretically they serve for explorative innovation;
- HR practices are not aligned to use employee capacity to the full extent;
- Certain practices might be established owing to employee activities rather than policies imposed by management;
- KM activities are integrated in HR practices;
- SC can impact the relationship between KM and innovation more than the link from HR practices to KM;
- Focusing on KM program can increase the effectiveness of HR practices, facilitate their alignment with organization strategy and finally, utilize the resources efficiently.

As I discussed earlier most of the propositions were not supported by empirical part. The difficulty was caused by the fact that majority of the companies didn't have a strategy on innovation. At the stage of sample selection I used as a criterion ***the need*** for innovation rather than merely innovative companies. The results showed that exploitative innovation was dominant in organizations. This goes in line with the statement of researchers that the exploitative innovation is a main driver for most of the organizations (Garcia & Calantone, 2002). One of the respondents noted:

> "Real breakthrough doesn't happen every day. And minor enhancements are a continuous process".

This shows that the need for innovation is mostly accomplished through incremental improvements. And this strengthens the argument of authors that radical advancements can be rare (Garcia & Calantone, 2002).

The fact that only exploitative innovation was dominant in most of the companies made it impossible to analyze the relationship of KM and HR practices with explorative innovation. Nevertheless, I found interesting configurations in KM and HR structures which in theoretical constructs were more connected to explorative innovation however in practice they existed in the framework of exploitative innovation. For instance, existence of generalist human capital, double-loop learning, result-based

appraisal, personalization strategy, mentoring and more emphasis on external knowledge sources opens two alternative assumptions. First, these strategies serve more for exploitative innovation. Second, companies use these strategies in order to stimulate rare and less established explorative innovation. Arguing about either of the alternatives is not possible with the empirical data that was obtained. The information is needed about the turnover from both, exploitative and explorative projects. Even though companies were requested about this data it was not possible to acquire it due to confidentiality issue. Hence, this can be dealt by future researchers.

Sometimes employees possess a potential to facilitate the development of certain objectives, but since it is not supported by respective policies this potential is not utilized fully. For instance, existence of generalist human capital and the tendency for double-loop learning might imply that there is a foundation for explorative innovation. However, the lack of cross-functional teamwork and brainstorming in teams shows that management policies are not aligned in absorbing the full capacity of employee potential in order to contribute to divergent thinking and thus to explorative innovation. As Nonaka (1994) states brainstorming and teamwork stimulate the transmission of tacit knowledge that can be embedded in the minds of employees. So, interesting questions arise – even though HR managers think that teamwork is an important practice for innovation why is it not implemented in practice? Does this go in line what I've stated earlier that aspiration of the management and reality differs? It's arguable.

Another interesting conclusion that can be contributory to what I've just mentioned is that certain practices might be established owing to employee activities rather than policies imposed by management. For instance, as stated in the discussion part, personalization strategy might be considered as an outcome of the attitude of employees willing to stay in organizations longer and thus form more firm relationships and informal environment. Hence, it's questionable whether mentoring is a stimulator of personalized strategy or vice versa. Tight relationships might become pre-requisites for informal coaching and mentoring. Does this mean that HR practices are not strong enough to impact knowledge management activities? Or does it imply that HR practices are affected by KM activities? The questions are still open.

The conclusion about the role of SC can be that the impact of SC on the relationship between KM and innovation might be stronger than on the link between HR practices and KM. Can I define SC as a promoter of KM channels in order to achieve innovation? Can they be more effective in impacting knowledge management than HR practices? The questions that arise with this finding may be an arena for further research.

The summary of empirically found relationships in Figure 4 opens an interesting conclusion points. It is vivid that four relationships have been captured to be directly formed between HR practices and one type of innovation. To go back to the research model this finding forms a support foundation for the dashed arrows between HR practices and innovation. Does this mean that KM channels are not able to strengthen the relationship between HR practices and innovation? Or does it indicate that KM channels were implicitly integrated in HR activities? I've discussed earlier that some of the HR practices were interchangeably used with KM activities. Based on this, I can assume that companies don't focus on knowledge management strategies, they don't identify them as vehicles, tools towards enhancement of innovation. In other terms, they have recognized them as integrative factors in HR practices. One respondent stated:

> "I think in general the current culture is more based on getting things done and focusing on an actual problem than building the bases to avoid certain problems."

This statement clearly denotes that due to rapid production cycle and increased speed in globalized processes things are being accomplished for a short term benefit, sometimes disregarding long-term impacts. Another statement of one of the participants, in certain way, fills the gaps or provides a solution for the previous quotation:

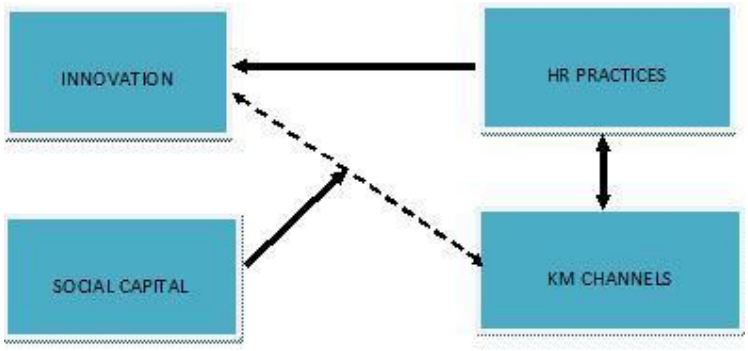
> "It's much more important to realize the culture where people are eager to get new information and to adapt that. That basic attitude is much more important than to have all the things on the shelf because the situation, the circumstances are changing constantly."

So, acknowledging the essence of roots of innovation rather than fixing blemishes on the surface might be more decisive, valuable and effective for the long term. That ***basic attitude*** to get new knowledge and adapt it can be enhanced by management policies, namely, by HR practices. So to shape my final conclusion the last question deriving from the finding is – what is the essence of KM if it's integrated in HR practices? KM channels can cover almost all human resources functions (Soliman & Spooner, 2000). However, knowledge management can facilitate bridging the knowledge gaps. As the authors argue having a KM program will make analysis easier what knowledge organization needs and what will the benefits be from that knowledge. After identifying the gaps human resources department can ensure where to find necessary knowledge (especially tacit) in the company or if not, obtain it from the labor market. On the other hand, KM program can facilitate identifying the capacity within employees that can be contributory to the organization strategy or further, support development of new strategies. As discussed above, the findings show that the potential of employees, such as the generalist human capital, tendency for double-loop learning, personalized relationships and knowledge from external sources are not fully utilized for the benefit of organization. They can be solid

backgrounds for developing explorative innovation in companies. Most of the participants mentioned that there was a clear picture what skills and knowledge were necessary and what the companies had. However, not having a clear strategy on innovation makes it difficult to argue whether the companies use existing knowledge for the benefit of their strategy. To put these notions in other terms, focusing on KM program can increase the effectiveness of HR practices, facilitate their alignment with organization strategy and finally, utilize the resources efficiently.

Having analyzed major conclusions of this study it's time to go back to the research model and the central question. Considering the empirical findings and above analysis I came up with a revised version of the initial model (Figure 6) that can be more applicable to the research outcomes.

Figure 6. Revised research model



In this model, it is clear that KM channels are integrated in HR practices where the latter has a direct link on innovation. The dashed arrows depict a weak link of KM channels on innovation where the social capital has a stronger impact.

In the theoretical section I've formulated a central question - *how can HR practices facilitate knowledge management that can enhance both explorative and exploitative innovation?* Theoretical findings showed that individual HR practices when structured for different purposes (i.e. training for existing skills vs. beyond existing skills) could serve for enhancing different KM channels. On itself the latter could impact either exploitative or explorative innovation. However, empirical part showed that KM channels in majority of the cases were integrated in HR practices. I can assume that due to the absence of strategy on innovation knowledge management channels took the form of HR practices. Based on this, the answer to the central question could be that after building an appropriate knowledge base in the company HR practices should be aligned afterwards. This can be accomplished with a number of approaches:

- Proper strategy on innovation;

- In-depth analysis of knowledge, skills and ability (KSA) gaps;
- Effective utilization and application of external knowledge sources;
- Alignment of HR practices to the specific KSA needs of the company;
- Ensuring consistency and congruence of HR practices;
- Constant assessment of outcomes for further improvement.

Since every study can have limitations this one is not exception either. First of all, I should mention that a small sample of companies made 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 my 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 teamwork was utilized frequently whereas questionnaire findings indicated that it was not an established practice. This fact made some results ambiguous and therefore the findings should be interpreted carefully, especially in terms of innovation. In addition, it was difficult to obtain a data on the outcome variable, such as a turnover from innovative projects due to confidentiality issue. This fact hindered the attempt to make valid investigation and conclusions. In addition, differences in understanding basic notions (innovation, knowledge creation) might have caused biased answers.

These limitations call for further investigation with another design. Since different aspects, for instance, 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. Additionally, for this type of research selecting a sample with a clear strategy on innovation can give possibility to better connect theoretical constructs. On the other hand, comparing two samples with clearly opposite strategies can be beneficial as well. In this case it will be easier to compare KM and HR practices and argue about their importance for certain types of innovation.

Overall, the intent of this study was to find a common ground between innovation, KM and HR practices. Considering all the aspects and uniqueness of this research, it might have formed a foundation in terms of theoretical and empirical constructs to build further studies on it.

References

Adler P.S. & Kwon W. K. (2002). Social Capital: Prospects for a New Concept. *The Academy of Management Review, 27,* 17-40

AitSahlia F., Johnson E. & Will P. (1995). Is concurrent engineering always a sensible proposition? *IEEE Transactions on Engineering Management, 42,* 166-170.

Ancona D., Bresman H. & Kaeufer K. (2002). The comparative advantage of X-teams. *MIT Sloan Management Review, spring,* 33-39.

Argote L., McEvily B. & Reagans R., (2003). Managing knowledge in organizations: an integrative framework and review of emerging themes. *Management Science, 49,* 571-582.

Bae J. & Lawler J. (2000). Organizational and HRM strategies in Korea: impact and turnover. *Academy of Management Journal, 37,* 670-687.

Barney J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17,* 99-120.

Bartol K.M. & Srivastava A. (2002). Encouraging knowledge sharing: the role of organizational reward systems. *Journal of Leadership and Organizational Studies, 9,* 64-76.

Belaver R.F. & Lusa J.M. (ed.) (2002). *Knowledge Management Strategy and Technology*. Boston, Artech House.

Benner M.J. & Tushman M.L. (2003). Exploitation, exploration, and process management: the productivity dilemma revisited. *Academy of Management Review, 28,* 238-256.

Bhatt G.D. (2000). Organizing knowledge in the knowledge development cycle. *Journal of Knowledge Management, 4,* 15-26.

Bhatt G.D. (2000). Information dynamics, learning and knowledge creation in organization. *The Learning Organization, 7,* 89-98.

Bhatt G.D. (2001). Knowledge management in organizations: examining the interaction between technologies, techniques, and people. *Journal of Knowledge Management, 5,* 68- 75.

Bodrow W. (2006). Knowledge management in small and medium-sized enterprises. *International Federation for Information Processing, 207,* 41-53.

Boxal P. & Purcell J. (2008). *Strategy and human resource management*. New York: Palgrave Macmillan.

Bryant S.E. (2005). The impact of peer mentoring on organizational knowledge creation and sharing, an empirical sturdy in a software firm. *Group & Organization Management, 30,* 319-338.

Bukowitz W. & Williams R. (2001). Knowledge management fieldbook. *Business Digest.*1-8.

Carneiro A. (2000). How does knowledge management influence innovation and competitiveness? *Journal of Knowledge Management, 4,* 87-98.

Cavusgil S.T., Calantone R.J. & Zhao Y. (2003). Tacit knowledge transfer and firm innovation capability. *Journal of Business and Industrial Marketing, 18,* 6-21.

Chen C. & Huang J. (2007). Strategic human resource practices and innovation performance – the mediating role of knowledge management capacity. *Journal of Business Research, 62,* 104-114.

Civi E. (2000). Knowledge management as a competitive asset: a review. *Marketing Intelligence and Planning, 18,* 166-174.

Cohen W. M. & Levinthal D.A. (1990). Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly, 35,* 128-152.

Cooper D.R. & Schindler P.S. (2008). *Business Research Methods*. New York: McGraw-Hill/Irwin.

Cummings L. & Schwab D. P. (1973). *Performance in organizations: determinants and appraisal.* USA: Scott, Foresman and Company.

Daroch J. & McNaughton R. (2002). Examining the link between knowledge management practices and types of innovation. *Journal of Intellectual Capital, 3,* 210-222.

Davenport T.H. & Prusak L. (2000). How organizations manage what they know. *Ubiquity Archive,* 1.

Delery, J. E., & Doty, D.H. (1996) Modes of theorizing in strategic human resource management: tests of universalistic, contingency and configurational performance predictions. *Academy of Management Journal,* 39, 802-835.

Demarest M. (1997). Understanding knowledge management. *Long Range Planning, 30,* 374-384.

Dhanaraj C., Lyles M.A., Steensma H.K. & Tihanyi L. (2004). Managing tacit and explicit knowledge transfer in IJVs: the role of relational embeddedness and the impact of performance. *Journal of International Business Studies, 35,* 428-442.

Dove R. (1999). Knowledge management, response ability, and the agile enterprise. *Journal of Knowledge Management, 3,* 18-35.

Evans P, Doz Y. & Laurent A. (1989). *Human resource management in international firms: change, globalization, innovation.* Great Britain: Billing and sons Ltd.

Fiol C.M. & Lyles M.A. (1985). Organizational learning. *The Academy of Management Review,10,* 803-813.

Garcia R. & Calantone R. (2002). A critical look at technological innovation typology and innovativeness terminology: a literature review. *The Journal of Product Innovation Management, 19,* 110-132.

Garvin D.A. (1993). Building a learning organization. *Harvard Business Review,* July-August.

Grant R.M. (1996). Prospering in Dynamically-competitive Environments: Organizational Capability as Knowledge Integration. *Organization Science, 7,* 375-387.

Greiner M.E., Böhmann T. & Krcmar H. (2007). A strategy for knowledge management. *Journal of Knowledge Management, 11,* 3-15.

Guidetti G. & Mazzanti M. (2007). Training and organizational innovations in the local industrial system: empirical evidence from Emilia-Romagna. *Human Resource Management Journal, 17,* 283-306.

Gupta B., Lyer L.S. & Aronson J.E. (2000). Knowledge management: practices and challenges. *Indistrial Management and Data Systems, 100/1,* 17-21.

Gupta A.K. & Singhal A. (1993). Managing human resources for innovation and creativity. *Research Technology Management,* 43-48.

Guthrie J.P. (2001). High involvement work practices, turnoever and productivity: evidence from New Zealad. *Academy of Management Journal, 44,* 180-190.

Guzzo R. A., Jette R. D. & Katzell R. A. (1985). The effects of psychologically based intervention programs on worker productivity: a meta-analysis. *Personnel Psychology, 38,* 275-291.

Hall P.A. & Soskice D. (2001). *Varieties of capitalism: institutional foundations of comparative advantage.* New York: Oxford University Press Inc.

Hansen M.T., Nohria N. & Tierney T. (1999). What's your strategy for managing knowledge. *Harvard Business Review, March-April.*

Hansen M. (1999). The search-transfer problem: the role of weak ties in sharing knowledge across organization subunits. *Administrative Science Quarterly, 44,* 82-111.

Hansen M.T.& Oetinger B. (2001). Introducing T-shaped managers: knowledge management's next generation. *Harvard Business Review,* 107-116.

Harrison R., & Kessels J. (2004). *Human resources development in a knowledge economy: an organizational view.* Basingstoke: Palgrave Macmillan.

Hayes R, Pisano G., Upton D & Wheelwright S. (2005). *Operations, strategy and technology: pursuing the competitive edge.* United Kingdom: Lightning source UK ltd.

Herrgard T. H. (2000). Difficulties in diffusion of tacit knowledge in organizations. *Journal of Intellectual Capital, 1,* 357-365.

Hislop D. (2002). Linking human resource management and knowledge management via commitment. *Employee relations, 25,* 182-202.

Holsapple C.W. & Joshi K.D. (2004). A formal knowledge management ontology: conduct, activities, resources, and influences. *Journal of the American Society for Information Science and Technology, 55,* 593-612.

Ichijo K. (2007). Enabling knowledge-based competence of a corporation. In Ichijo K. & Nonaka I. (Eds), *Knowledge creation and management: new challenges for managers (pp. 83-96),* New York: Oxford University Press.

Ichiowsky C., Shaw K. & Prennushi G. (1997). Effects of human resource management on productivity: a study of steel finishing lines. *The American Economic Review, 87,* 291-313.

James W.M. (2002). Best HR practices for today's innovation management. *Industrial Research Institute,* 57-60

Jansen J.J.P., Van den Bosch F.A.J. & Volberda H.W. (2006). Exploratory innovation, exploitative innovation and performance: effects of organizational antecedents and environmental moderators. *Management Science,* 1-32.

Kamoche K. (1997) Knowledge creation and learning in international HRM. *The International Journal of Human Resource Management, 8,* 213-225.

Kamoche K. & Mueller F. (1998). Human resource management and the appropriation-learning perspective. *Human Relations, 51,* 1033-1060.

Kang S., Morris S.S. & Snell S.A. (2007). Relational archetypes, organizational learning, and value creation: extending the human resource architecture. *Academy of Management Review, 32,* 236-256.

Kang S.C. & Snell S.A. (2009). Intellectual capital architectures and ambidextrous learning: a framework for human resource management. *Journal of Management Studies, 46,* 67-92.

Keller R.T. (2001). Cross-functional project groups in research and new product development: diversity, communications, job stress, and outcomes. *Academy of Management Journal, 44,* 547-555.

Koberg C.S., Detienne D.R. & Kurt A.H. (2003). An empirical test of environmental, organizational, and process factors affecting incremental and radical innovation. *Journal of High Technology Management Research, 14,* 21-45.

Krogh G.V., Ichijo K. & Nonaka I. (2000). *Enabling knowledge creation: how to unlock the mystery of tacit knowledge and release the power of innovation.* New York: Oxford university press.

Kohli A.K. & Jaworski B.J. (1990). Market orientation: the construct, research propositions and managerial implications. *Journal of Marketing, 54,* 1-18.

Lado A. & Qilson M.C. (1994). Human resources systems and sustained competitive advantage: a competency-based perspective. *Academy of Management Review, 19,* 699-727.

Lam A. (1998). Tacit Knowledge, Organizational learning and innovation: a societal perspective. *Danish Research Unit for Industrial Dynamics (DRUID), working paper,* 98-22.

Lawler E. E. (1993). From job-based to competency-based orgnizations. *Center for effective organizations, School of business administration, University of Southern California, CEO Publication, G 93-8 (228),* 1-23.

Leana C.R. & van Buren H.J. (1999). Organizational social capital and employment practices. *The Academy of Management Review, 24,* 538-555.

LeCompte, M.D. & Preissle, J. (1993). *Ethnography and Qualitative Design in Educational Research*. London: Academic Press, Inc.

Lee H. & Choi B. (2003). Knowledge management enablers, processes, and organizational performance: an intefrative view and empirical examination. *Journal of Management Information Systems, 20,* 179-228.

Leonard B.D. (1997). *Wellsprings of Knowledge.* Cambridge: Harvard Business School Press.

Leonard D. & Sensiper S. (1998). The role of tacit knowledge in group innovation. *California Management Review, 40,* 112-132.

Lim K.K., Ahmed P.K. & Zairi M. (1999). Managing for quality through knowledge management. *Total Quality Management, 10,* 615-621.

Loewenstein M.A. & Spletzer J.R. (1999). General and Specific Training: Evidence and Implications. *The Journal of Human Resources, 34,* 710-733

Lopez-Cabrales A., Perez-Lun A. & Cabrera R.V. (2009). Knowledge as a mediator between HRM practices and innovative activity. *Human Resource Management, 48,* 485-503.

Lutz, R. A. (1994). Implementing technological change with cross-functional teams. *Research-Technology Management, 37,* 14-18.

Majchrzak A., Cooper L.P. & Neece O.E. (2004). Knowledge reuse for innovation. *Management Science, 50,* 174-188.

Madhavan R. & Grover R. (1998). From embedded knowledge to embodied knowledge: new product development as knowledge management. *Journal of Marketing, 62,* 1-12.

March J.M. (1991). Exploration and exploitation in organizational learning. *Organization Science, 2,* 71-87.

Matthews J. (2008). Developing creative capital: what can we learn from the workforce? In *proceedings creating value: between commerce and commons,* Brisbane, 1-8.

McCampbell A.S., Clare L.M. & Gitters S.H., (1999). Knowledge management: the new challenge for the 21st century. *Journal of Knowledge Management, 3,* 172-179.

McDermott R. (1999). Learning Across Teams: The Role of Communities of Practice in Team Organizations. *Knowledge Management Review,* 1-8.

Michie J. & Sheehan M. (1999). HRM practices, R&D expenditure and innovative investment: evidence from the UK's 1990 workplace industrial relations survey (WIRS). *Industrial and Corporate Change, 8,* 211-234.

Mumford M. (2000). Managing creative people: strategies and tactics for innovation. *Human Resource Management Review, 10,* 313-351.

Nahapiet J. & Ghoshal S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review, 23,* 242-266.

Nonaka I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5,* 14-37.

Nonaka I. & Takeuchi H. (1995). *The knowledge-creating company, how Japanese companies create the dynamics of innovation.* New York: Oxford university press.

Nurmi R. (1998). Knowledge-intensive firms. *Business Horizons,* 26-32.

Olson E. M., Walker O. C. & Ruekert R. W. (1995). Organizing for effective new product development: the moderating role of product innovativeness. *Journal of Marketing, 59,* 48-62.

O'Reilly C.A. &Tushman M.L. (2004). The ambidextrous organization. *Harvard Business Review,* 74-81.

Osterloh M. (2007). Human resource management and knowledge creation. In Ichijo K. & Nonaka I. (Eds), *Knowledge creation and management: new challenges for managers (pp. 83-96).* New York: Oxford University Press.

Pan S. L. & Scarbrough H. (1999). Knowledge management in practice: an exploratory case study. *Technology analysis and strategic management, 11,* 359-374.

Pfeffer J. & Sutton R.I. (1999). Knowing "what" to do is not enough: turning knowledge into action. *California Management Review, 42,* 83-108.

Polanyi M. (1962). Tacit knowing: its bearing on some problems of philosophy. *Reviews of Modern Physics, 34,* 601-616.

Popadiuk S. & Choo C.W. (2006). Innovation and knowledge creation: how are these concepts related? *International Journal of Information Management, 26,* 302-312.

Quintas P., Lefrere P. & Jones G. (1997). Knowledge management: a strategic agenda. *Long Rage Planning, 30,* 385-391.

Rastogi P.N. (2000). Knowledge management and intellectual capital - the new virtuous reality of competitiveness. *Human Systems Management, 19,* 39-48.

Ribière V. M. &Román J. A. (2006). Knowledge flow. *Idea Group Inc,* 336-343

Robertson M. & Hammersley G.O. (2000). Knowledge management practices within a knowledge-intensive firm: the significance of the people management dimension. *Journal of European Industrial Training, 24/2/3/4/,* 241-253.

Ruggles R. & Little R. (1997). Knowledge management and innovation: an initial exploration. *Working paper.*

Saenz, Aramburu & Rivera (2009). Knowledge sharing and innovation performance. *Journal of Intellectual Capital. 10,* 22-36.

Scarbrough H. (2003). Knowledge management, HRM and innovation process. *International Journal of Manpower,* vol. 24, No. 5, pp. 501-516.

Shipton H., West M.A., Dawson J., Birdi K. & Patterson M. (2006). HRM as predictor of innovation. *Human Resource Management Journal, 16,* 3–27.

Soliman F. & Spooner K. (2000). Strategies for implementing knowledge management: role of human resources management. *Journal of Knowledge Management, 4,* 337-345.

Schelfhaudt K. & Crittenden V.L. (2003). Specialist or generalist: views from academia and industry. *Journal of Business Research, 58,* 946-954.

Stewart T. A. (1997). Intellectual capital, the new wealth of organization. *Knowledge Management, 67,* 1-10.

Subramanian A. & Nilakanta S. (1996). Organizational innovativeness: exploring the relationship between organizational determinants of innovation, types of innovation, and measures of organizational performance. *International Journal of Management Science, 24,* 631-647.

Subramaniam M. & Youndt M.A. (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal, 48,* 450-463.

SwapW., Leonard D., Shields M. & Abrams L. (2001). Using mentoring and storytelling to transfer knowledge in the workplace. *Journal of Management Information Systems, 18,* 95-114.

Yahya S. & Goh W. (2002). Managing human resources toward achieving knowledge management. *Journal of Knowledge Management, 6,* 457-468.

Waldman D., Lituchy T., Gopalakrishnan M., Laframboise K., Galperin B., & Kaltsounakis Z. (1998). A qualitative analysis of leadership and quality improvement. *Leadership Quarterly, 9,* 177- 201.

Wiig K.M. (1997). Knowledge management: where did it come from and where will it go? *Expert Systemswith Application, 13,* 1-14.

Wiig K.M. (1997). Integrating intellectual capital and knowledge management. *Long Range Planning, 30,* 399-405.

Appendix A. Interview Protocol

The role of knowledge management and intellectual capital in the relationships between HR practices and innovation

We would like to thank you in advance for your cooperation in our research. Our research is about the link between human resource practices and innovation, where the role of knowledge management and intellectual capital of the organization is studied. In total, seven profit and non-profit organizations will be interviewed in the region of Twente. This interview is structured in a way to give us broad overview of the issues we are investigating.

Before the interview we have sent a document as introduction with a research model and definitions on different concepts we distinguish. We also brought a print of this document to this interview.

The results of the research will be presented at a seminar which will be scheduled in October 2009. This research is conducted for the relevance of two Master theses in the field of HRM and innovation. Hence, if you are interested we can send the final versions of these theses when they are ready.

Mention this if company participated in innovation scan: your company participated in the project ´Competences for innovation´, this data have been used for the preparation of this interview.

For this interview we have a timeslot of 60 minutes.

We would like to ask your permission to record this interview. The recording will not be given to others.

Questions

General

- How many years have you served in the company and for how long in this position?
- Could you describe your role and position in the company?
- When we look at the research model, do you have general remarks or ideas upfront on these topics?

Innovation

- On the topic of innovative performance, how would you perceive poor performance, good performance and excellent performance? And where does this company stand now?
- Do you recognize the process of minor improvements or changes in products and processes in your company? Could you give examples?
- Do you recognize the process of fundamental changes in products and processes in your company? Could you give examples?
- Does the company experience problems in the innovation process within the company?
- Has the company set a priority on the mentioned types of innovations?
    - (Probe/ could be asked depending on time): How much do you invest in different innovation projects and what is the turnover resulting from these projects?

Capitals

- Does the company have a clear picture what skills and knowledge are necessary in the company and what skills and knowledge are available?
- In what way is building relationships inside and outside the company relevant and is this stimulated or stifled by the company?
- How would you value the existence of creativity in your organization?
- Do you experience a need to improve the presence of so called human capital and organizational social capital in the future?
- How do you perceive (the level of) trust within the company?
  Can you give us some examples or incidents that affected (the level of) trust?
- Can you describe the way the company handles internal and external relationships? For example, does team work occur, is socializing stimulated, is it common to go to seminars, are customers and suppliers invited in R&D projects.
    - (Probe/ could be asked depending on time): Does your company explicitly manage creativity of employees?

Knowledge Management

- Do employees in your company create and exchange knowledge? If so, how?
- What methods do you use to support this process? In other words, can you describe the process of creation, transfer and use of knowledge within the company?
- How would you value these processes for your organization? Can you recognize the outcomes of knowledge creation, transfer and use? In what way?
- Do you experience a need to change the process of knowledge creation, transfer and use in the future?

HR practices

- What kind of human resource practices do you find in your organization and are they explicit and formalized?
- How would you value all the mentioned practices for your organization?
- Do you experience a need to improve their presence in the future?
- Does the company have specific practices intended explicitly for increasing innovative performance?
- Do you experience a need for other practices that hasn't been mentioned in the model?
- Did we miss any topic or element that you find important to be included in this interview?

We are at the end of the interview, thank you very much for your cooperation. We would like to request for a recent annual report (*or if not available, organizational chart*) for additional input. The information that you provided will be very beneficial for our research. A literal transcript of this interview will be prepared and sent to you to confirm its accuracy. As mentioned, the results of this research will be presented at a seminar to be scheduled in October 2009.

To collect sufficient data for our research we could use more detailed information regarding the same topics we just discussed. Could you give us the name of a relevant person in your company who will be able to provide this kind of feedback? We will send a detailed questionnaire later by e-mail.

Appendix B. Measurement Model

Innovation	
I 4.	We constantly invented new products and services that are completely new for our organization in the last 2 years. (Jansen, Bosch & Volberda, 2006)
I 5.	We constantly introduced improvements to products and services of our production line in the last 2 years. (Jansen, Bosch & Volberda, 2006)
I 6.	How much of your turnover (in percentage) do you invest in R&D activities?
I 7.	Out of this investment how much (in percentage) is dedicated to developing completely new products and services?
I 8.	Out of this investment how much (in percentage) is dedicated to improving existing products and services?
I 9.	How much revenue is obtained from completely new products and services developed in the past 2 years? (can be indicated in percentage, out of total revenue of the company).
I 10.	How much revenue is obtained from improved existing products and services? (can be indicated in percentage, out of total revenue of the company).
Knowledge Management (acquisition) (Darroch, 2003)	
KMA28.	We survey employees regularly to assess their attitudes toward work.
KMA 29.	Managers frequently try to find out employees' true feelings about their jobs.
KMA 30.	We're quick to detect changes in our customers' preferences.
KMA 31.	Information about our competitors is collected by more than one department within our organization.
KMA 32.	We meet with customers at least once a year to find out what products and services they will need in the future.
KMA 33.	Our organization does a lot of market research.
KMA 34.	We survey end-users at least once a year to assess the quality of our products and services for future.
Knowledge Management (creation)	
KMC 35.	The management takes into consideration the ideas suggested from employees.
KMC 36.	We regularly work in teams to brainstorm on ideas and develop them.
KMC 37.	In our organization, learning environment is promoted in order to support new knowledge generation.
KMC 38.	Many of our employees have worked for our organization for a long time.
KMC 39.	Our organization provides mechanisms to promote new idea suggestions (e.g. idea boxes).
KMC 40.	Roughly how many new ideas have been suggested to improve products and/or services during the last 2 years?
KMC 41.	Roughly how many new ideas have been suggested to generate completely new products and/or services during the last 2 years?

HC 12.	Our employees have skills that can be used in other organizations.
HC 13.	Our employees have skills which are not available to our competitors.
HC 15.	Our employees prefer to work in teams rather than alone.
Knowledge Management (dissemination) (Saenz, Aramburu & Rivera, 2009)	
KMD 42.	Our organization has IT-based knowledge sharing.
KMD 43.	We share knowledge through:
	e-mail
	online discussion forums
	Intranet
	Extranet
	groupware tools
	online knowledge repositories
	written reports
	other
KMD 44.	Mostly communication between employees is face-to-face.
KMD 45.	Employees share knowledge through:
	meetings by field of interest
	storytelling and/or lessons learned and/or best practice collection and diffusion
	meetings, events and/or workshops in order to promote reflection as well as knowledge and experience sharing with external agents
KMD 46.	Employees are provided with right knowledge, skills and ability when needed.
KMD 47.	Our workspace is set up to make it easy for people to talk to each other.
KMD 48.	Marketing people in our organization frequently spend time discussing customers' future needs with people in technical departments.
KMD 49.	Information about customer satisfaction is disseminated to all levels of our organization on a regular basis.
KMD 50.	We often write case notes on successful and unsuccessful products and services.
KMD 51.	Employees are expected to provide feedback to others whenever they attend conferences, seminars or exhibitions.
Knowledge Management (responsiveness)	
KMR 52.	We are quick to respond to customer complaints.
KMR 53.	We are quick to respond to concerns raised by employees.
KMR 54.	Our organization seems to be able to implement marketing plans effectively.
KMR 55.	We manage to keep up to date with technological developments that could affect our business direction.
KMR 56.	When something important happens to a competitor the whole organization knows about it quickly.
HR Practices (training)	

HRPT 57.	57. Most of our employees are participating in on-the-job trainings.
HRPT 58.	58. Most of our employees participate in classroom trainings.
HRPT 59.	59. Teamwork is an important part of all the education programs.
HRPT 60.	60. Mentoring and/or coaching on the job is common in our organization.
HRPT 61.	61. Training prepares employees with skills beyond their current job requirements.
HRPT 62.	62. Training prepares employees with further improvement of existing skills.
HRPT	What is the number of hours of training received by a typical employee over the last 2 years?
HR Practices (job rotation)	
HRPJ 68.	Employees with highly specific skills and knowledge are rotated within the same area of specialization.
HRPJ 69.	Our employees rotate to other areas of specialization.
HR Practices (performance appraisal)	
HRPPA 70.	Performance appraisals are focused on evaluating the process.
HRPPA 71.	Performance appraisals are focused on evaluating the outcomes.
HRPPA 72.	Performance appraisal objectives are focused on avoiding errors.
HRPPA 73.	Performance appraisal objectives are focused on forgiving errors.
HRPPA 74.	Performance appraisals include peer feedback.
HRPPA 75.	Performance appraisals evaluate individual performance.
HRPPA 76.	Performance appraisals evaluate team performance.
HRPPA 79.	In performance appraisals we discuss the needs of our employees.
HR Practices (rewards)	
HRPR 83.	Rewards provide incentives for new idea suggestions.
HRPR 84.	Rewards are granted to teams.
HRPR 85.	Rewards are granted for good performance and effort.
Pre-conditions (organization structure)	
POS 100.	How many hierarchical layers are in your organization?
POS 101.	Middle level managers contribute effectively to the exchange of knowledge and information between upper and lower hierarchical levels.
POS 102.	In our organization mostly top management creates information which is later disseminated to the lower levels of organization to be implemented.

POS 103.	In our organization most decisions are based on the information suggested from the lower levels of the organizational structure.
Pre-conditions (social capital)	
OSC 20.	Our employees subordinate their own goals to the goals of the organization.
OSC 22	Our employees mutually trust each other.
CC 106.	The organization members trusted and supported one another.
CC 104.	The organization climate is warm and positive.
CC 107.	Our employees help each other to contribute to the overall performance of the organization.
CC 108.	The working environment in our organization is rather informal.