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## Knowledge management for open innovation: comparing research results between SMEs and large companies

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Hannele Väyrynen\*

Tampere University of technology, PO box 541, 33101 Tampere,  
Finland.

E-mail: [hannele.vayrynen@tut.fi](mailto:hannele.vayrynen@tut.fi)

Nina Helander

Tampere University of technology, PO box 541, 33101 Tampere,  
Finland.

E-mail [nina.helander@tut.fi](mailto:nina.helander@tut.fi)

Tytti Vasell

Tampere University of technology, PO box 541, 33101 Tampere,  
Finland.

E-mail [tytti.vasell@tut.fi](mailto:tytti.vasell@tut.fi)

**Abstract:** Knowledge co-creation and effective knowledge sharing boost innovativeness in companies. However, rapidly developing technologies and constant changes in the business environment challenge the companies' practices for knowledge management (KM). The purpose of this paper is to compare the key KM practices and their effect on open innovation between the small and medium sized companies (SMEs) and the large companies, and as empirical focus, comparing them through quantitative survey and complementary qualitative interviews. The results indicate that large companies are more externally open to innovate than SMEs and the large companies also value open dialog and knowledge sharing more. Whereas, SMEs seem to rely more on developing their internal practices to support innovativeness. In the both company sizes technology is used rather poorly to support access to open data and networks. The identified factors provide insights for developing KM practices that support open innovation in varying sizes of companies.

**Keywords:** Knowledge management, innovation, openness, network, large companies, small and medium-sized enterprises

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## 1 Introduction

Knowledge is typically a firm's central resource and the source of competitive advantage (Stewart, 1997; Brooking, 1999; McCune, 1999; Teece, 2000; Fleisher, 2002; Laihonon et al. 2013; Aggestam, 2015). An overall goal of knowledge management (KM) is to utilize information and competencies effectively to allow organizations to anticipate, implement, adapt and develop their operations (Dalkir, 2013), both inside the organization and across inter-organizational boundaries. In this way, it has been argued that KM also sets a path towards open innovation (Lichtenthaler, 2011; Zheng et al. 2011; Lakemond et al. 2016). Several scholars, (Brunswick & Vanhaverbeke 2015; Dahler & Gann, 2010, Chesbrough 2003) argue that both external knowledge and ideas as well as internal capacities are important for open innovation activities. Thus, both the external and internal ideas and paths are valuable for open innovation, even though the concept of open innovation is more often used to refer to the innovation processes between inter-organizational boundaries. It can be argued that the internal activities are also critical to open innovation, especially in terms of open knowledge sharing between the individuals, teams and different organizational units. Some studies, like Henkel (2006), even point out openness as something revealing ideas previously hidden inside organizations. In this paper concentration is on these internal activities and practices supporting open innovation, thus referring more on the organizational and technological uncertainties and challenges related to innovations than on the commercial ones (Freeman & Soete 1997; Hall et al. 2011).

KM has already received a great deal of attention among both academics and managers for over two decades. Nonaka and Takeuchi (1995) provoked discussion about the importance of knowledge creation, and both Grant (1996) and Spender (1996) presented the idea of a knowledge-based view of the firm. The multidisciplinary approach to the field of KM (e.g., Maier, 2002; Dalkir, 2013; management science, information science, organization science, sociology, and psychology) has yielded a situation in which KM can be seen as a quite comprehensive and many-sided phenomenon; it has also led to a somewhat blurred nature of the field. Hence, much research has been done on the development of the field's core concepts (Huber 1991; Nonaka & Takeuchi 1995; Hansen 1999; Ståhle & Grönroos 1999; Alavi & Leidner 2001; Bartol & Srivastava 2002; Maier 2002; van Burg et al. 2008; Wang & Noe 2010), but also its relation to innovation management (Ortt et al. 2006; Lichtenthaler 2011; Zheng et al. 2011).

This paper focuses more on the internal KM practices, but the external sources of knowledge are also taken into account through a network perspective. The aim of this study is to compare the key KM and open innovation practices and challenges between small and medium sized companies (SMEs) and large companies. A similar kind of study was carried out in Finland over ten years ago (Hannula et al. 2003), pinpointing the biggest challenges of KM and their impact on innovativeness and productivity. The present study argues that despite of all the technological development happening during

the last ten years, the challenges that the companies face in KM and open innovation are still nearly the same than they were in fourteen years ago – why?

The article structure begins the theoretical premises of KM. As empirical research, the paper continues by presenting the methodological choices of the study and its comparative empirical analyses between SMEs and large enterprises. In the conclusion section, the key results of the study are highlighted, and directions for further studies are opened up.

## **2 Theoretical insights**

Knowledge differs from other resources in a company. By nature, knowledge accumulates and is dynamic over time, and knowledge does not cause additional costs (Prahalad & Hamel, 1990; Leonard-Barton, 1995; Shapiro & Varian, 1999; Nonaka et al., 2001; Dalkir, 2013). Knowledge can also be hard to grasp (Krogh von and Roos, 1995). Therefore, solid knowledge resources can separate a company from its competitors in a manner that is difficult to copy. Thus, KM (see e.g. Nonaka & Takeuchi 1995; Grant 1996) can be argued to offer a set of principles and tools to support work in the modern networked society (Valkokari et al. 2007).

To utilize knowledge effectively, it should be designed, acquired, developed, and utilized well. (Nordhaug, 1994; Nonaka & Takeuchi, 1995; Hislop, 2013) To have proper KM processes, organizations must build physical, social, and resource-allocation structures (Teece, 1998). However, the definition, discovery, and use of knowledge are often found to be challenging (Ståhle & Grönroos, 1999; Dalkir, 2013), not least because it is difficult for organizations to recognize relevant knowledge or to identify how technology could be used to support knowledge utilization. It can be said that the main idea in KM is the effective diffusion and promotion of the reuse of existing resources (Wah, 2000), as well as the management of the sharing and application of knowledge and the improvement of knowledge creation (Marchand & Davenport, 2000; Hislop, 2013). In order to create new knowledge in organizations, effective sharing and integration of knowledge is a necessity. According to Krogh et al. (2001), companies must find a way to inform the possibilities of knowledge exchange and the benefits to be obtained, as well as to motivate personnel to transfer knowledge.

Regarding the above, continuous human resource development and systematic learning goals are needed to support the adoption of new knowledge and technology. Management and leadership skills play essential roles in supporting organizational work, especially in change situations. Lakemond et al. (2016) highlight the important of the project management and knowledge matching through the innovation process. While it is important to take care of an effective project management, especially in the beginning of the process, it is also essential to take care that knowledge-matching procedures are related to performance in every stage. In general, management can also have a huge influence on the smoothness of the work of personnel and the productivity of the company, but also the birth of potential knowledge-sharing barriers within organizations (Kukko et al., 2008; Matson & Prusak, 2010; Kukko et al., 2012), which is one common

and remarkable issue that diminishes innovativeness of the company. Ho (2009) expressed that strategy and leadership, organizational culture, organizational incentive systems and information technology (IT) are the key factors enabling efficient knowledge utilization and support within organizations.

Technology can be viewed from the perspectives of different organizational functions (see, e.g., Benson et al., 1993; Kivimaa et al., 2006), but to the role of technology in knowledge development. Technology should be understood at both the organizational and the individual level (Frambach et al. 2002) and it is important to identify technological possibilities through technology forecasting to maintain competitiveness (Kostoff et al. 2004). Knowledge sharing and technology utilization can be explored as suggested by Khalifa et al. (2006), from the viewpoint of the adoption of IT in SMEs. As Brunswicker & Vanhaverbeke (2015) state, the role of SMEs play growing role in open innovation, even though its relevance in literature seems to be more focused on large enterprises. The utilization of technology and information integration, like data mining, was possible as early as the 1990s (Larson 1998); however, our ability to utilize these data with KM is still limited. Technology definition and technology utilization involve constant revisions to organization processes, and not only because of the rapidly changing technologies and operational environment, but also because of the new kinds of customer demands and the need for new employee competences (Daim et al., 2008). In addition, understanding partners' technological skills and capabilities supports open innovation (Lakemond et al. 2016).

However, effective utilization of technology is not sufficient to ensure KM success. Behind any successful KM process development should be clear strategic thinking. A KM strategy is defined as a general, issue-based approach to defining operational strategy and objectives with specialized KM principles and approaches (Dalkir, 2005). Like KM strategy, a well-defined, goal-oriented innovation strategy supports company's future business opportunities and the possibilities to explore new technologies or capabilities to aim new markets (ie. Brunswicker and Vanhaverbeke 2015). Environmental changes drive companies to develop their business activities, which means that they need to identify, assess and map their existing knowledge strengths and determine which kinds of KM strategies and systematic processes to apply to support the work of their personnel. (Hansen et al. 1999; Seeley and Dietrick 1999; Zack 1999; von Korgh et al., 2001; Ortt et al. 2006) but also of their network partners (Schilling 2010). This is especially true as customers become increasingly involved in companies, their technology systems and their knowledge creation and innovation processes (see e.g. Krogh et al., 2001). Instead of storing information and knowledge explicitly, KM that supports open innovation should link people to one another in order to cultivate person-to-person knowledge sharing. Through this strategy, organizations could create and stimulate networks among people in order to share and study their individual skills, experiences and expertise (Scheepers, Venkitachalam, & Gibbs, 2004), which are in central role of open innovation (Chesbrough 2003). This kind of approach would also support the idea of Cassiman & Valentini (2016) of integrating the inward and outward knowledge transfers to foster open innovation. However, divergent networks and changing technologies cause uncertainties that need to be recognized and concerned as part of a KM strategy.

### **3 Empirical examination**

#### *3.1 Sample and data collection*

The research focuses to explore the use of KM in different-sized companies in Finland and the effect on open innovation capability. The study was carried out as a quantitative survey with qualitative interviews. The quantitative methods enabled effective data gathering from large company groups and the interviews verified the quantitative results. For theory verifications and generalizations, quantitative research generally employs a survey design (Creswell 2003), which has also been utilized in this research.

The respondents' industries included manufacturing and construction, wholesale and retail trade and finance and services. The researchers wanted to get both human and technical perspectives; thus, representatives from the HR and the ICT functions were contacted. Of the large companies' respondents, 84% (n=36) represented companies with more than 2500 employees. The SMEs (n=22) were divided such that eight companies had less than 100 employees, five less than 300 and three had more than 300 employees. Six of the companies did not report their employee numbers. In total, the sample was collected from 58 companies via 51 Internet-based questionnaire responses and seven structured phone interviews from SMEs from June to November 2014.

#### *3.2 Measures*

The questionnaire was divided into different themes covering the various aspects of KM. The first theme addressed the organizational structure and strategic capability, since these forms the backbone of KM in organizations. This aspect included questions on decision-making practices, feedback and confidence, technology utilization and organization structures and their support for knowledge sharing. The second theme focused on organizational process capabilities: IT utilization, information and competence acquisition, development and implementation. The third part explored organizational effectiveness and innovation capability. All the previous themes were asked on a five-point Likert-type scale. When evaluated internal consistency of the scales, Cronbach's alpha coefficient indicated a good internal consistency level ( $\alpha > 0.60$ ).

The data were statistically analyzed using SPSS and the interviews were analyzed with content analysis. Frequencies were used to examine the distribution of responses and for certain analysis were made into sum variables. For regression analyses were chosen Spearman's rho with the stepwise method and with explorative use because Spearman's rho allows slightly variance diffusion (Wied et al. 2014).

The authors are aware of the low response rate and therefore analyses with highly statistical significant results are considered. Because of the low response rate, the results can be considered descriptive, rather than universal.

The measurement of knowledge utilization and development in the companies in general are explained next and after that companies' technology utilization. KM challenges and development targets that the companies face are measured before the statistical significance levels of open dialog and open knowledge access on company innovation. The last measurement of this paper is expressed of internal and external networks effect on innovation capacity.

### 3.2.1 *Measuring knowledge utilization and development*

Processes are important when operationalizing KM in practice. The companies' process capabilities were investigated with regard to communication technology utilization, information and competence procurement, knowledge sharing, organizing and developing, and information and competence implementation.

The data was operationalized into internal and external information utilization with respect to the information, the competence obtained and the application. In this study, internal information includes knowledge required for internal process operations. External information includes communications with partners and contacts, as well as information that comes from outside the company. KM development was analyzed by drawing in descriptions of information and communication technology utilization and of how organizations were able to utilize new and old knowledge constructively. In large companies the method was principal component analysis and rotation method Varimax with Kaiser Normalization. The factor loadings smaller than 0.60 were not a part of the component. Based on these large companies' components the sum variables were made for three items: Use of internal data and information, use of external data and information and knowledge and competence development. In Table 1 is showed how different size Finnish companies utilize knowledge and information systems.

**Table 1** Rotated component matrix (sum variable) for usage of knowledge and IT in large company organizations (% , n=36) and in SME organizations (% , n=15)

	1	2	3	4	5	Cannot Say	Total
<b>LARGE COMPANIES</b>		3	36	50	11		100
Use of internal data and information		5	14	58	23		100
Use of external data and information		3	31	47	19		100
Knowledge and competence development							
<b>SMEs</b>							
Use of internal data and information			40	60			100
Use of external data and information			30	60	10		100
Knowledge and competence development			40	60			100

Notes:

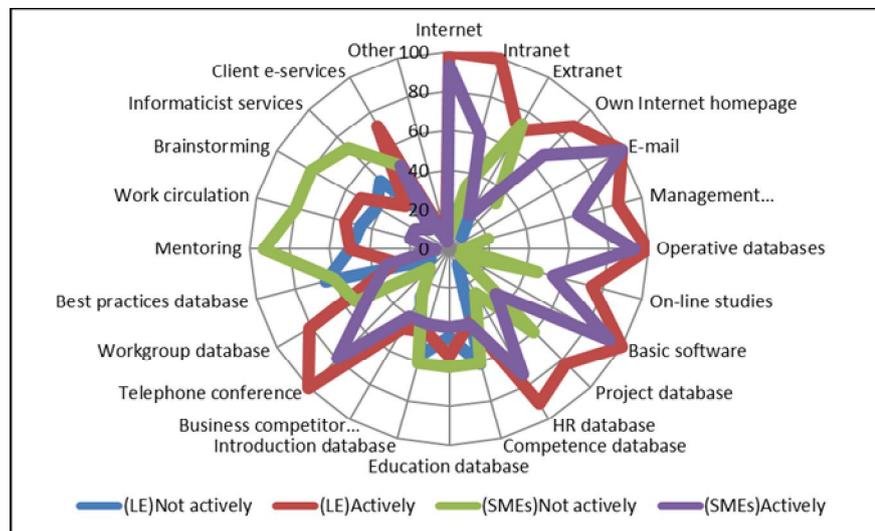
scale 1 = Totally disagree, 2 = Somewhat disagree, 3 = Neutral, 4 = Somewhat agree, 5 = Totally agree

Source: Helander et.al (2015).

The table 1 indicates that the respondents' image of available data and information utilization and knowledge and competence development is that the companies utilize actively. Let's keep this in mind when exploring information technology utilization, KM challenges and development targets and innovation.

### 3.2.2 Measuring information technology utilization

Information and system technologies suggest many possibilities to improve processes in companies. Technology utilization was classified with Likert-scale from 1 "Not in use" to 5 "Active use" and "Can't say". The results are expressed with graphic how the companies use the certain databases or the information systems (Figure 1).

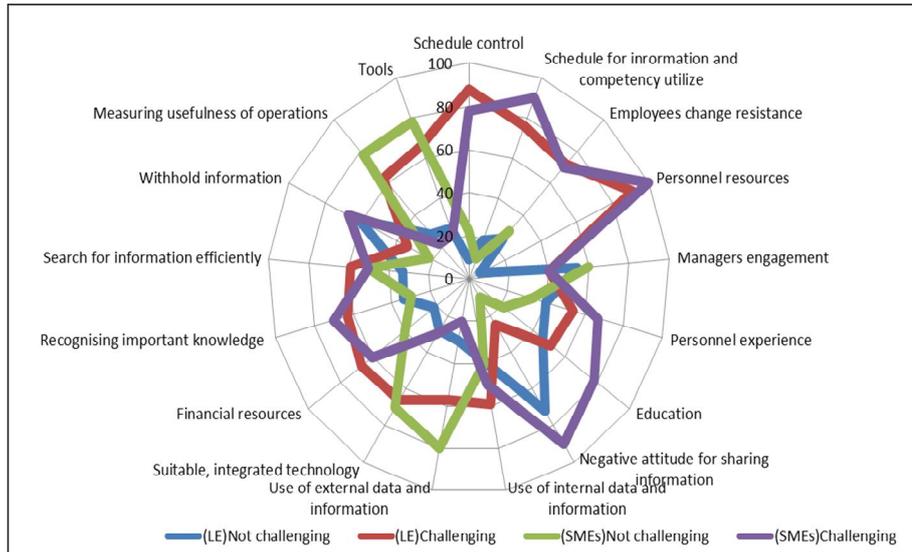


**Figure 1** Usage of information systems among large enterprises and SMEs (% , N=51).

The graphic indicates that both the large companies and SMEs input their information systems utilization to operational systems while personnel's competence and innovation databases are not in active use.

### 3.2.3 Measuring KM challenges and development targets

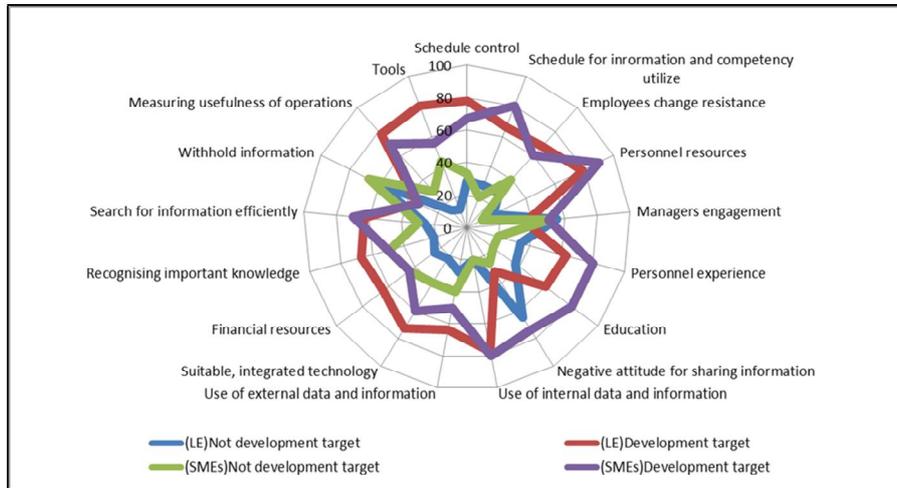
The respondents were asked to rate the challenges and development targets of KM in general. The importance of 17 challenges and development targets were asked on a five-point Likert-type scale. The respondents evaluated how they thought about challenges in their company with value 1 "Not challenge at all" and value 5 "A big challenge". Cronbach's alpha indicated a good internal consistency for the factors ( $\alpha = 0.927$ ). The challenges are expressed in figure 2.



**Figure 2** Organizational challenges in large enterprises and SMEs (% , N=51).

Figure 2 demonstrates the kinds of challenges large companies and SME organizations faced in KM. Based on the collected responses, the biggest challenge in large enterprises concerned personnel resources, the second biggest concerned keeping schedules, and the third biggest concerned organizations' internal knowledge utilization. A total of 40% of the respondents stated that it was challenging to integrate suitable technology into processes.

The development targets were evaluated with value 1 "Not development target at all", while 5 meant that there was a big necessity of the development for certain issue in the company (figure 3.) 17 factors identified a good internal consistency (Cronbach alpha  $\alpha = 0.938$ ).



**Figure 3** Organizational development targets in large enterprises and SMEs (% , N=51).

### 3.2.4 *Measuring the effect of openness and networking on company's innovation capability*

Sum variables comprise six items: open knowledge dialog, open knowledge availability, internal and external networks, which internal consistence was good ( $\alpha > 0.68$ ), and organization's innovation and innovation capability of organization. Cronbach's alpha indicated these dependent sum variable a good internal consistence level ( $\alpha > 0.80$ ). Regression analyses were conducted on these sum variables to identify correlations between items. The correlations are expressed in table 2.

**Table 2** Spearman's rho correlations

Notes: N=51, method Spearman's rho stepwise, \*\*correlations significant at  $p < 0.005$ , \* = at level  $p < 0.01$ .  $r^2$  = explanation of the systematic variable range at level  $p < 0.001$ .

	<i>Correlation internal networks</i>	$r^2$	<i>Correlation external networks</i>	$r^2$	<i>Correlation open dialog</i>	$r^2$	<i>Correlation open access to knowledge</i>	$r^2$
Variable Innovation capability large companies	0.474**	0.28	0.507**	0.32				
Variable Innovation capability SMEs	-.118	-	-.262	-				
Variable Innovation large companies					.791**	0.61	.719**	0.64
Variable Innovation SMEs					.357	-	.790*	0.75
Cronbach's alpha	.696		0.747		0.873		0.679	

Correlations show the direct effect on companies' innovation. Open access to information and competence information explained 64 % of the innovation systematic variable range in large companies ( $\beta = 0.802$ ,  $p < 0.001$ ), while in small and medium size enterprises the explanation was 75 % ( $\beta = 0.865$ ,  $p = 0.001$ ). However, open dialog in SMEs didn't explain innovation at all, whereas the fact of open dialog in large companies seems to positively affect company innovation, ( $\beta = 0.778$ ,  $p < 0.001$ ).

Findings indicate that only large companies find that network effects on innovation capability. External network was a stronger agent for the innovation capability (32 % explanation of systematic variable range,  $\beta = 0.566$ ,  $p < 0.001$ ) than the internal network (28 %,  $\beta = 0.532$ ,  $p = 0.001$ ).

In all, both the online questionnaire and the complementary interviews addressed open dialog and open access and companies' networks effect on innovation capability within the broader frame of KM.

## 4 Results

In the following, the key findings of the empirical study are examined. The question can be produced: how the companies in varying sizes can succeed in open innovation? This question is answered in the following results paragraph.

#### *4.1 KM challenges and development targets*

As Figure 2 illustrated, the biggest challenge for SMEs in KM was internal knowledge utilization and the exploitation of time resources for information and competence. The second challenge was the efficiency of knowledge acquisition and administration, while the third was human resources and the fourth was time management and the measuring of business operation utility. The respondents specified that because of the enormous amount of information, it is essential to identify the relevant information. They hoped that IT systems could facilitate this process. They also specified that competence management should be implemented within organizations' daily processes.

What aspects did the companies underline as requiring development? Figure 3 demonstrates the organizations' development targets. The most important target for large companies with regard to KM development was internal knowledge utilization. The many indicators of this study confirm that KM utilization, or the recognition of resources, was not that effective with regard to organizational potential. The second most important development target was change resistance and schedule management. As a challenge, change resistance in KM was number five. The third was personnel resource management development and the fourth was suitable and integrated technology systems for operational support.

With regard to development targets in KM, SMEs recognized, firstly, time resources for information and competence utilization. The second most important development target was internal and external knowledge utilization. The responses revealed more potential in SMEs' organizations to input resources for identifying knowledge. Furthermore, personnel's negative attitudes related to knowledge sharing were one development target. The respondents wished that their organizations would devote more effort to communication development. The third named development target was human resources and training programs.

#### *4.2 Information technology utilization*

The following results explain how actively large companies and SMEs utilize information technology. As Figure 1 demonstrates, in large enterprises, information systems, particularly operational databases, are used actively in process management. Furthermore, project management systems are utilized well. Human resource databases were used by all large companies sampled. Intranets were considered an efficient way to deliver information. With regard to education and competence databases, the results showed that activity levels were low or that companies did not have these systems at all. Positively, perhaps online learning environments were used actively; however, some of the companies did not have online learning systems.

Technology in large enterprises was used actively for external communication. All of the companies used the Internet actively. One explanation could be that the companies had

their own web pages, as well as (possibly) web services and interactions with customers. Customer databases were also used actively. Figure 1 illustrated that SMEs' information technology utilization activity in process management was 66% due to operational systems. SMEs seldom used project management systems (PMSs). However, SMEs used technology for external communication well. Electronic customer services were used in 28% of the studied SMEs and extranets for external communications were used very seldom.

With regard to the possibilities for digitalization utilization, the SMEs took the first steps. However, the understanding of the definition about digitalization was not always clear. Some of the respondents stated that implementation depends on an individual's skills to utilize digitalization. Some of the companies had plans, but their implementation had failed.

It can be noted that organizations invest real-time information (in operations) and external connections information management (for clients or outside interactions) instead of internal information processes and competence development systems (which were used inactively). As such, one can ask, based on the research findings whether the respondents' understandings of KM development were unrealistic comparison with the use of information systems activity.

#### *4.3 KM for innovation, openness and networks*

The results suggest that KM's main function is to ensure that the company has relevant business information and competence resources for operations. With KM, the purpose is to advance communication and common understanding with personnel. The respondents emphasized the need to listen to others, the ability to compromise and the capacity to work together to reach set goals.

In large companies, real-time information, easy-to-find information, and learning at work explained 49% of the organizations' internal information utilization variable range. Information in the right place, finding the information, noticing proposals for improvements and updating processes and instructions explained only 10% of this range. In SMEs, internal data and information management was ensured through good instructions and daily co-operation among different departments and personnel.

However, the respondents stated that there was a need to develop in internal knowledge assimilation and verify knowledge implementation. In some operations, the companies had the responsibility to receive information, but there was no checking process to ensure that the knowledge shared was also utilized in processes. The respondents emphasized the responsibility of superiors and employees to verify that the knowledge is implemented in processes and that the documents and information are updated.

The use of external data and information, based on large companies' responses, had a higher level than the use of internal information. Organizations' existing processes concerning external information on new products and services, competitors, markets and information explained 35% of the organizations' external information utilization variable range. Moreover, networks with new ideas, the reverence of new employees, and new employees' knowledge and competence were included this component. It seems that there is a connection between employers and their support for employee networks ( $r = 0.516$ ,  $n = 36$ ,  $p < 0,005$ ). However, 6% of the respondents stated that they did not know whether there was a process for supplying information on new products, services, competitors, or processes for communication with partners.

Among SMEs' it seems that external information procuring is focused on certain business units and actors in relation to networks, new ideas, the knowledge of new employees and the utilization of this knowledge. Knowledge development, together with customers and co-operators, was seen to be very important and networks were constructed through co-operations with other business units situated in different localities or, for example, by participation in training programs outside the organization.

Concerning open access to knowledge, networks and innovations, our study illustrates that organizations don't take the effective advantage of technology of data. There may be limited access e.g. competence databases or data systems are not in active use that could improve on data utilization and encourage the new ideas. Also networking don't seem to be a strategic operating model, which means that networking may rest of the singular unit or an energetic employee. Based on rather recent OECD report (2015) comparing Nordic countries' companies' ability to utilize external knowledge in innovation processes, it seems that Norway and Denmark utilize market knowledge (e.g., suppliers, customers, competitors) most effectively, while Finland and Sweden utilize this knowledge least effectively. However, Norway and Finland utilize institutional sources (e.g., higher education and the government) the most effectively, while Denmark and Sweden utilize such sources least effectively. In Finland, large companies, in particular, collaborate on innovation with higher education or research institutions one and a half times more than those in Sweden (which is second). Finnish SMEs are also the most active in collaboration. Norway is in the third place and Denmark is in fourth place. (OECD 2015, 142–145.)

The level of knowledge development in large companies was seen to reflect a rather good level. Strategy-based consistency for the evaluation of competency, utilization and development explained 51% of the KM development variable range. However, there is no efficient way to utilize the new information that comes with new employees. New information and competence development with teamwork also had a low level, explaining only 10% of the KM development variable range.

SMEs respondents thought that knowledge development was quite good. Central aspects were development discussions and goals set together with superiors and employees.

Some of the companies engaged in competence mapping internally, and some of the companies used external consults. The main point was that competence evaluation needs to be an ongoing process and that competence needs to be complemented with internal training or external education. A big challenge for SMEs was that the training and development programs used were not implemented successfully, mostly because employees were not engaged in the implementation. Surprisingly, work circulation was used quite seldom (53%), with 30% of the companies using this approach seldom or not at all. Developing and working in groups was seen as one important way for the transfer of competence. The use of competence mapping and team co-operation was also verified to be a substitute system in these organizations. However, the companies did not have any systematic practice for how to utilize new employees' knowledge. Introduction was the key function and the respondents emphasized the responsibility of superiors and other employees to identify new knowledge and implementations. However, introductions were seen as employers teaching in an up-to-down manner, not as bottom-up knowledge sharing that could boost innovativeness more.

In all, based on the research findings, it is possible to identify several rather important development areas and targets in KM in different company sizes. However, development needs are also always requiring resources. When we compare the various Nordic countries, it is clear that Finland has the second highest R&D expenditures on information industries in the entire OECD area. Other Nordic countries' expenditures are approximately half or less of those of Finland (OECD 2015, 160). As the OECD report stated, "Information and communication technologies (ICTs) are key enablers of innovation throughout the economy" (2015, 160). In Nordic countries, Finland is first in terms of SMEs that produce or process marketing or organizational innovation at the same time, coming before Sweden, Denmark and Norway. However, with regard to large enterprises, Denmark is first in terms of mixed modes of innovation. Next are Finland, Sweden and Norway (OECD 2015, 162).

## **5 Conclusions**

This study examined the KM practices and challenges in different company sizes and their effect on open innovation. The results verified those of earlier studies carried out in the Finnish context (see e.g. Hannula et al. 2003) concerning the biggest challenges of KM: companies have face challenges defining what KM really means for their organizational processes and, further, how to develop systematic KM practices and build a KM strategy. These findings get support also from Lakemond et al. (2016) finding of the significance of knowledge matching and its positive effect during the innovation process: knowledge really matters and combining external knowledge and resources with internal capabilities creates a good ground for collaborating innovation work. Identifying those factors that cause uncertainty among employees may offer a set of management activities that support innovation practices (e.g. Jalonon 2012). As Ortt et al. (2006) states, building a KM strategy that includes uncertainty management, organization structural aspects, possibility for learning and continuous environment scanning may lead to the "entrepreneurial nature of innovation". It means that companies also need to devote

effort to strategy implementation and not only on the managerial level but open dialog between the different organization levels in order to support innovation capability. (Ibid.) Furthermore, as earlier studies (Lakemond et al. 2016; West & Bogers, 2014) have stated, an effective company strategy requires an engaging open innovation process. We believe that combining external knowledge and resources with internal capabilities creates a good ground for collaborating innovation work. Matching partners' technological competencies and knowledge, an effective project management and open communication with company's own expertise and innovation process, implementation and commercialization can be successful.

Such investments are a central way to achieve innovativeness in companies. A proper KM strategy would indicate the key practices that support open knowledge sharing – focusing both on internal and external knowledge sharing. For external knowledge sharing technology can bring new kind of support, but based on our study both the large companies and the SMEs have not fully taken use of the potential of technology for knowledge sharing, e.g. in the form of digital platforms. However, companies do not survive in the markets alone but need collaborative networks, both internal and external. Schilling (2010) states that especially “interfirm networks are an important engine of innovation”. However, they also need management effort in order to be successful, as Lakemond et al. (2016) state.

The results indicate that large companies are more externally open to innovate than SMEs and that they also value open dialog and knowledge sharing more. As Brunswicker and Vanhaverbeke (2015) state, one possibility might be that SMEs have only little understanding of the internal component of openness. Understanding this requires managerial capabilities in both strategic and operational levels. The study also shows that the use of technology to support the access to open data and networks is rather poorly used in both company sizes. Technical changes lead to other problems that need to be tackled to avoid uncertainties (Hall et al. 2011) and open dialog for the fear of technology adoption can guide for forward experiment with new ideas. The uncertainty tackle with learning processes can release those “dynamic capabilities” that Schilling (2010) calls for.

Our study has inherent limitations. First, our data were collected from an average of half of the 50 largest companies and from a small cluster of SMEs in Finland. Even though the results reflect the same kinds of specifics, the thesis should be seen as descriptive, rather than universal. Second, the sample is quite small; therefore, the results should be rechecked with additional analysis methods.

This study identified some correlations for KM challenges and open innovation capabilities. Our contribution to the open innovation research field is that we emphasize for discussion that despite all the technological improvement in recent years, there is still lack of such solutions and practices that would promote innovation entrepreneurship. In future studies, there is need to more carefully study the development of KM as an inter-

organizational practice in a globalized and networked business environment. Additionally, KM should be further studied as a practice that helps organizations to develop and maintain their innovation capability. There is also a need for both academic and empirical research about open innovation in SME context.

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