Intra-organizational Knowledge Networks in a Multinational Company

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Abstract

This study focuses on a challenge faced by multinational companies: how to enhance knowledge sharing across national and divisional boundaries. Through an in-depth qualitative analysis, this article illustrates how cross-functional and -cultural virtual teams based on identified internal network structures assist in integrating the knowledge of sales, marketing, and R&D people. Moreover, the present paper demonstrates how the multinational company can create effective spaces and processes for knowledge sharing networks where their employees can both access knowledge and provide it to others, thus mitigating the negative effect of physical and cultural distance on the availability of support and information.

Keywords: Knowledge sharing, virtual teams, intra-organizational networks, management

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Introduction

Intra-organizational networking via virtual teams is an emerging strategy for improving inter-functional knowledge sharing (Jarvenpaa and Leidner, 1999). The present study investigates the implementation of virtual teams through a longitudinal qualitative research in a single case study setting. In the empirical analysis, we focus on the role of the virtual teams as a part of an intra-organisational knowledge management system. The study sheds light on the challenges and potential benefits of virtual teams in the context of an organization-wide multi-cultural knowledge network, elaborating the barriers and enablers of knowledge sharing. Therefore, this study contributes to the discussions on virtual teams and learning in networks in international and multi-cultural organizations.

The current article poses questions: “How can a multinational enterprise improve its knowledge sharing through internal networks?” and “What is the role of virtual teams in knowledge creating networks?” Particular attention is paid to the context of knowledge, knowledge creation processes, the global setting, and multiculturalism. Knowledge sharing is looked at the level of an intra-organizational network, encompassing virtual team structures and information systems support.

Theoretical discussion

The study builds on literature on learning in networks (e.g., Araujo, 1998, Bångens & Araujo, 1999, Håkansson et al., 1999, Knight, 1999, Håkansson, 1993, Lundvall, 1993). Learning is defined as the process of creating knowledge (Gibb, 1997). We regard learning and knowledge creation processes as ongoing, dynamic, and social processes that can occur intentionally or unintentionally, in everyday activities (see e.g. Araujo, 1998, Gherardi, 1999).

In the IMP group, researchers generally assume that network actors learn by personal experiment, by using the knowledge and experiences of their counterparts or by learning together from the knowledge and experience of several actors (Håkansson, 1993; Håkansson et al., 1999). In the network context learning takes place at three levels: at the individual level, at the net level (or at the dyad, the triad level), and at the network level (individual, group, and organizational networks) (Crossan et al., 1999). The company’s ability to create spaces and processes that encourage and allow the interaction throughout the network is important since the same knowledge is oftentimes needed in different network levels and locations.

Although encouraging and allowing the interaction is critically important, it is also very challenging, particularly in companies where functional, cultural, and physical distances create barriers for learning and knowledge sharing. Studies have noted, for example, the challenges of knowledge creation and knowledge sharing that relate to the international working environment, such as time differences, lack of face-to-face interaction, and cultural issues (Lucas 2006; Minbaeva 2005). These challenges can become a major concern especially in companies where effective knowledge sharing on complex issues is required among geographically, culturally, and functionally dispersed network locations.

Virtual teams have been presented as one solution to the challenges facing multinational companies. Virtual teams are defined as those whose members collaborate, using technology in working across geographical, cultural, and functional boundaries (Kirkman et al., 2004; Martins et al., 2004). While previous studies have discussed virtual teams of as few as three and as many as one hundred members (Martins et al., 2004), this paper focuses on teams that are more conventional in size, between five and ten individuals. Recent studies of Vlaar et al. (2008) and Ratcheva (2008) argue that processes supporting knowledge synergy and shared understanding make virtual teams a potentially powerful new organizational form. The era of empowering employees to work collaboratively is well established in organizational practice (Peters and Manz, 2007). One of the key examples of collaborative empowered work in organizations is centered on creating virtual teams that are comprised of members who may reside in different time zones and countries (Horwitz et al., 2006; Kirkman et al., 2004). As technology has improved and collaborative software has been developed, virtual teams whose members spread across diverse physical locations have become increasingly prominent (Kirkman and Rosen, 1999).

Denton (2006) argues that it is the ability of electronic and web-based techniques, which has led to the concept of virtual teams. Cascio and Shurygailo (2003) emphasize that work can now be conducted anytime, anywhere, in real space or through technology hence overcoming the key challenges facing global companies. Denton (2006) argues that virtual teams can act in a coherent and coordinated way if they have a continuous real-time flow of information about where they are at and whether or not they are meeting expectations. The intranet, when combined with the proper managerial groundwork, makes it easy for group members to see the results of their work and compare that to where they want to go. Thomas et al (2007) conclude that with better technology facilitation, team members can spend more time enjoying what they do, and less time under stress and working late-nights or weekends due to missed deadlines and failed virtual team interaction.

Literature on global virtual teams generally frames the impediments to coordination and collaboration as based on divergent nationally-based cultural attributes, language barriers, and the limitations of information and communication technologies (David et al. 2008). National and local cultures are seen to impact distributed work (Krishna et al., 2004). Indeed, the literature on globally distributed teams generally frames the impediments to coordination and collaboration in terms of communication problems due to the divergent nationally-based cultural attributes of the sites, language barriers, and the limitations of information and communication technologies (ICTs) (Kankanhalli et al., 2007; Mihhailava, 2007).

There are many potentially important factors that could impact on virtual teamwork in various ways. In literature, these include trust (Jarvenpaa et al. 1998) and shared understanding (Liedtka, 1996), which can be defined as a clear sense of strategic direction for all team members, and depth of relationships (Peters and Manz, 2007). First, without trust, virtual teams could not be effective as individual members would not be willing to take the risk that another team member would act in their own self-interest, rather than the teams (Jarvenpaa et al. 1998). Second, in a virtual setting, because team members cannot see one another’s work, it is important that there is shared understanding about roles and accountabilities. This leverages expertise, facilitates coordination, and avoids redundancy and duplication of work (Duarte and Snyder, 2001). Third, Maznevski and Chudoba (2000) show that at the early stages of the formation of a virtual team, face-to-face meetings are important, especially if complex strategic issues are central to the performance of the team.

One of the major obstacles to overcome when using computer-mediated communication is the lack of personal interaction. Without face-to-face meetings, facial expressions and body language are lost making communications between team members difficult to interpret and understand especially when cultural differences exist among members of the team. However, organizations can overcome many of the impediments caused by the lack of face-to-face interaction by effectively training (Rosen et al., 2006) and by empowering (Kirkman et al., 2004) virtual teams and their members. To summarize, prior research (e.g. Jarvenpaa et al, 1998; Liedtka, 1996; Peters and Manz, 2007) shows that the members of virtual teams must have an open mind and be willing to listen to, and trust in, their teammates. They must also possess the ability to deal with conflict productively and be supportive, rather than authoritative, in the team environment.

As the above discussion implicates, knowledge sharing is difficult, particularly when sharing complex knowledge among a remote group of heterogeneous actors. Moreover, when different actors do not have an opportunity to be in the face-to-face contact, as is the case with virtual context knowledge sharing becomes even more difficult. However, as the studies we discuss above suggest, there possibly are means to transform virtual teams into effective knowledge sharing conduits. Concerns related to the development of shared, common, or mutual understandings include the influence of geographically dispersion, technology mediation, team members’ perceptions of others’ integrity, ability and benevolence, trust, training, and empowerment. Next we shall proceed to discuss the case and the design of the empirical research. In the empirical research, we demonstrate the role of virtual teams in augmenting an organization’s internal knowledge sharing on complex technology and customer-related matters.

Case Vaisala Instruments

Vaisala Instruments is one of Vaisala Corporation's three business units. Its main business is developing, manufacturing, and selling industrial measurement applications. Of Vaisala's other two business units Vaisala Measurement focuses on meteorological measurement devices, whereas Vaisala Solutions provides its customers, such as road administration agencies, with comprehensive environmental measurement systems. Vaisala Instruments (VI) accounts for approximately one third of Vaisala Corporation's annual sales of 224 million euro (2007). In a similar vein, VI employs one third of Vaisala Corporation's thousand employees and generates one third of Vaisala's annual profit of 37 million euro (2007).

Particularly interesting about Vaisala is that 97 percent of its sales come from outside its home country, Finland. Thus, the company has an extensive sales and service network, with 24 offices in 12 countries. Because each business unit serves different customer groups, they all have their own dedicated salespeople. Vaisala has some 440 (39 percent) salespeople scattered in different locations around the globe. Despite this global sales presence, most VI's other functions and operations are located in its headquarters in Finland. In particular, all VI's R&D and product line marketing functions reside in the company headquarters near Helsinki.

The only noteworthy exemption is Vaisala's Boston office, which provides technical services to Vaisala's customers in North America. Yet, neither R&D nor product line marketing have physical presence in Boston as these activities are centred in Finland.

The business process structure of VI's organization builds on three main functions: R&D, product line marketing, and sales. First, as VI is a research intensive organization that develops a wide range of products of high technical sophistication, its R&D personnel plays a key role in the business processes. Specifically, problems that customers face with the VI's products frequently call for R&D people's attention; who have the best expertise in measurement algorithms and other technological specifications needed to solve the problem. For R&D, the benefit of these inquiries is that they may reveal products' deficiencies and can be further used when improving existing products or developing new products.

Second main function is the product line marketing, which acts as the commercial counterpart of R&D. The primary task of product line marketing people is to coordinate all activities that revolve around the products and product families. These tasks include, for example, providing salespeople with product-related information, representing the customer in product development, and finding new markets and application areas for the products. The third main function is sales, which is VI's primary contact to the customer. Thus, in this role, salespeople are in most need for product-related information while, at the same time, they are the main providers of information on customers, markets, and product feedback. Unlike the employees of other two main functions, salespeople are spread in numerous locations around the world. Further, where nearly all R&D and product marketing people are Finnish, salespeople represent more than 20 different nationalities.

Method

Because of the complexity of the phenomenon under study, a single case study approach (e.g. Stake, 2000) with several data collection methods; e.g. participant observation, interviews, and a survey based social network analysis (SNA) was chosen. The case company represents a multi-cultural organisation with topical need to manage enterprise-wide knowledge creation and sharing. Abductive, qualitative research approach is taken in the analysis of knowledge creation in this study (Dubois and Gadde, 2002; Shank, 2002: 119). The rich case data provides us with both practical and theoretical implications.

The research process followed the realization of the actual knowledge project within the case company (see table 1). First the identified knowledge challenges were discussed and analysed by the project and research teams, the material consisting of company presentations and interviews of company personnel and company project member. Then the different models and understandings on knowledge were reflected jointly. After this familiarization phase the empirical research on sales and project organisations started. A company project member interviewed most of the international and local sales staff. Summary tables on each interview were provided for the research team and this company project member was interviewed by the researchers.

An SNA method was used to identify the knowledge sharing paths between the sales and product lines personnel. First, in order to uncover product-related knowledge sharing, salespeople were asked to indicate which product line marketing people supplied them with knowledge and what was the quality of that knowledge. Second, product line marketing people were respectively asked to indicate salespeople who supplied them with market-related knowledge and rate the quality of that knowledge. A link to an online form was sent to 105 individuals. For salespeople the online form presented the names of all product line marketing people. By checking a box before each name salespeople indicated who supplied them with product-related information. Furthermore, after each name there was a dropdown menu presenting numbers from 1 (the lowest) to 3 (the highest) for rating the quality of knowledge provided by the person in question. Identical online form was presented to product line marketing people, but it presented the names of salespeople and the question asked about receiving market- instead of product-related knowledge. This analysis was then used to create knowledge teams for each product line.

Also a portal supporting the work of the teams was created. At this point the understandings on knowledge and results of previous studies on knowledge sharing were brought up again in the research and project team. To plan the initial setting up both of the portal and the knowledge team, the reflections on knowledge and the models shared were used. A workshop to initiate different views on knowledge was given to each knowledge team in connection of the data gathering interviews at their start up workshops. Altogether 4 project team interviews and 28 sales person interviews were conducted. The teams were interviewed either each member individually or as a group; (5 individual interviews/ team one and 4/team four) and two teams were interviewed as a group (6 persons/team two; and 8/ team 3). In practice, all actors directly involved in the virtual team project were interviewed. Thus, interview data is likely to be highly representative of the case. Interviewees were asked to discuss their specific role in the company, function, and office location. We then asked them to discuss their experiences of knowledge sharing, communication, and cross-functional collaboration in VI. In general, discussions covered the barriers of knowledge sharing, VI's organizational culture, tangible cooperation within and outside Vaisala, methods of communication, and any other issues that interviewees raised during the discussion.

We also had access to see virtual teams in work by observing the created portal in connection to project team meetings. This enriched our knowledge on the activeness of communication, depth of issues discussed, and the type of topics covered in the discussions. The analysis was conducted throughout the research process in line with the abductive research approach. Table 1 highlights the key theoretical frame and concepts used in each research phase. Yet, the concepts and theories are intertwined, hence for example, the ideas on nature of knowledge were used in all of the phases, but their role was emphasised in phase one.

Table 1 Data collection methods and conceptual issues in each phase of the empirical study

	Data collection	**Conceptual issues**
Identifying challenges	32 Interviews with key actors (project team and virtual team members) Discussions within the company and projects team	Learning in networks Knowledge sharing models Previous experiences from research
Establishing teams	Interviews SNA	Network studies Virtual teams Communities
Functioning of teams	Interviews Observations	Learning in networks Virtual teams Knowledge sharing

Analyses and findings

Knowledge sharing challenges before the founding of virtual teams

> *"We have realized that there is a lot of knowledge in peoples' heads that should be put into movement"*

Although VI did not undergo any particular crisis on the matter, its internal knowledge sharing system was considered needing an improvement. On the one hand, salespeople did not always feel receiving all the product specific knowledge that they needed in selling and serving the customer. This is understandable given that there are thousands of different product configurations that they were supposed to sell to extremely heterogeneous customer groups. On the other hand, product marketing personnel were not completely satisfied with the amount and the quality of customer information and product feedback that they got from salespeople. For example, they complained that salespeople did not tell them about the potential problems and deficiencies of the products or the dissatisfaction of customers, until these issues seriously started to hurt the sales. Moreover, instead of selling their newest and the most sophisticated products, salespeople preferred to sell the products they were already familiar with; and instead of finding new customers, salespeople preferred to sell to their existing customers. As Kauppila et al. (in press) contemplate, these difficulties are largely caused by the organization's failure to offer support to its salespeople.

The project manager was well aware of the need to share various types of knowledge. The previous systems had only concentrated on explicit knowledge in a quite formal reporting format. Moreover, there were cases of seeing knowledge as possession enabling power – for example during company's internal idea competition rather than jointly create ideas single individuals preferred to keep their ideas to later be put into the competition, building on their self interest rather than for common good (e.g. Newell et al, 2006; Jarvenpaa et al., 1998). It was concluded that there were at least five specific issues that complicated or impeded knowledge sharing in VI's organization:

1. Geographical and cultural distances among the actors
2. Functional boundaries
3. Complexity of product-related knowledge
4. Dispersed markets
5. Overreliance upon a few individuals as knowledge providers

Geographical and cultural distances did not influence knowledge sharing between R&D and product line marketing, as both people from both functions were located in the same building and shared the same cultural background. However, the case with sales function was totally different. In general, salespeople were not only geographically and culturally distant from R&D and product line marketing, but they were also distant from one another. For example, the sales people's learning during customers calls about the customer needs was not passed on (see e.g. Håkansson 1993). This was potential source of problems as same customers were present in multitude of markets, for example a multinational company could be a customer for both Boston and Japan sales office. At the more instrumental level, calling to Finland was also difficult from Vaisala's offices in Asia, Australia, and North America, because of different time zones. Cultural distances, in turn, were reported especially between employees in the Western countries (Western Europe, North America, and Australia) and Asian countries (China and Japan). Facing similar challenges as has been found in many studies on multinational companies (see e.g. Krishna et al., 2004; Mäkelä, 2006; Lucas, 2006; Minbaeva, 2005).

As VI's employees are mostly organized by their task function, boundaries between different functions are inevitable. The benefits of functional organizing are especially significant for R&D people, because the development of sophisticated instruments is largely dependent on close collaboration among scientists and technical specialists. However, homogeneity within the functional groups accentuated the heterogeneity between the functions. In some cases, intergroup heterogeneity presented difficulties in communication and knowledge sharing, as people in different functions did not always understand concerns, priorities, or even terminology that were used in discussing the matters. Also, functional boundaries reduced interfunctional face-to-face interaction, which restrained the development of trust and mutual understanding between people from different functions. (e.g. Horwiz et al., 2006, Jarvenpaa et al., 1998)

VI's products are complex, highly sophisticated, and the product range is enormous with thousands of different product variations. This presents a huge challenge particularly to VI's salespeople, who are expected to identify what the customer needs, find the appropriate product from VI's product range to resolve the need, understand which variations the customer would need, and then provide help and assistance with the product. Because of these requirements, salespeople need constant product-related support, technological consultation help, and other necessary information, on pricing, for example. VI's product line marketing and R&D people are primary providers of knowledge helping the salespeople to cope with their extremely demanding role. However, as discussed above, geographical, cultural, and functional barriers impede communication and knowledge sharing.

As there was a great variety of products as there was variety of customers and market needs. Atypical VI's customer purchased only a few instruments once a year or even less frequently. Thus, the contribution of individual customers to VI's annual sales was generally very modest, hundreds or thousands of Euro. Modest sales volume per customer implied that in order to reach high turnover, VI had to serve great numbers of customers. Again, this was a challenge to VI's salespeople who had to deal with the large pool of customers, compromising numerous industries and hundreds of product application areas. In the same way, dispersed markets and a large heterogeneous customer pool was a challenge to product line marketing and R&D people who were not only supposed to supply necessary technical and product related information, but also utilize customer and market information in developing new products and targeting new markets. The experiences and learning of the sales force was not systematically utilized. Taken together, the organization's knowledge sharing had to work in two basic directions: first, technological and product-related support from other functions to salespeople, and second, customer and market knowledge from salespeople to other functions.

When the project elaborated in this paper begun, much of VI's knowledge sharing burden rested on a few individuals who acted as bridges between salespeople and the rest of the organization. All of these individuals were product line marketing people, whose formal job description included the mediating role between commercial and technological matters. However, even among the product line marketing people, the knowledge sharing burden in both directions tended to accumulate on a few individuals. This kind of sparse network involved several risks and disadvantages for VI's knowledge sharing For instance, most knowledge sharing is repetitive in nature as questions and requests usually touch upon same

issues. These repetitious questions and answers to them obstruct knowledge flows in already congested bridging positions. Therefore, knowledge flows get slow, reaching necessary recipients gets difficult, and important requests get snowed under simple requests. This is a problem because virtual teams cannot act in a coherent and coordinated way if they do not have a continuous real-time flow of information about where they are at and whether or not they are meeting expectations (e.g. Denton 2006). Moreover, the organization's knowledge sharing system is seriously harmed every time one of the key individuals leaves the organization. This is because these individuals have a great deal of tacit knowledge and social capital that are hard to replace. Their accumulated experiences and learning has not been passed on to others. The constant need to mediate large amounts of information and respond numerous requests can also cause strain and fatigue to individuals in a few bridging positions, increasing the risk of employee quitting (e.g. Thomas et al., 2007).

Developing virtual teams and tools for knowledge sharing

> *"I noticed that when there is hurry they call to the person they know will answer rapidly, and if not they will call to the person from whom they think they will get the best answer"*

As the first step in finding workable solutions for the challenges based on discussions among research and project team VI decided to establish global, interfunctional virtual teams to improve knowledge sharing within the company and eventually exhort all VI employees to participate actively in reciprocal knowledge sharing activities. Another, related goal was to strengthen ties across functions and countries, and overall build a denser internal network among VI employees. Denser network was perceived desirable because it increases the speed and extensiveness of knowledge diffusion. Moreover, the dissemination of complex product- and market-related, and even tacit knowledge, is much more likely to happen in dense than in sparse networks (Hansen, 1999).

Initial social network analysis

Before establishing virtual teams, the project team wanted to find out whom exactly did each employee turn to for seeking information they needed, and how they would rate the quality of knowledge they received from these sources. After the SNA analysis the project teams could identify specific individuals being the nodes of knowledge flows. The analysis exposed both directions of primary knowledge flows. Figure 1 presents an example of the knowledge flow diagram that was created for one of the product lines.

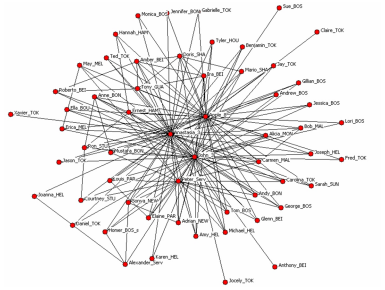

Figure 1 A product line knowledge network

In Figure 1, the nodes represent individuals in one product line's knowledge sharing network prior the new virtual teams were established. As discussed above, each connection between two nodes represents an active knowledge sharing relationship whereas the thickness of the line indicates the employee-rated quality of knowledge in the relationship. These kinds of sociograms where created for each of five product lines as well as for VI's organization as a whole. The graphical presentation of sociograms helped VI's managers in selecting appropriate individuals to virtual teams and planning for effective means to train the members of the teams.

Selecting and training virtual team members

The results of knowledge flow analyses and sociograms were utilized in selecting virtual team members. A virtual team was established per each VI's product line, which meant establishing five teams, as there were five product lines. To each team VI's project team selected the product line marketing people who were already active in sharing and mediating knowledge. With this, the purpose was to strengthen the existing knowledge sharing structures that were active and that employees were familiar with. Moreover, one or two other product line marketing people were added to each virtual team. This aimed to balance the burden among the product line marketing people and give them all an equal opportunity to participate in knowledge sharing.

Besides the product line marketing people, salespeople were the other elemental group in virtual teams. In general, each team composed of three product line marketing people, six salespeople and a person from R&D or technical services. As product line marketing people, salespeople were selected based on their existing ties, activeness and ability to share knowledge, as perceived by the product line marketing. Moreover, because the mission of virtual teams was to promote knowledge sharing within the whole global organization, salespeople were selected to teams from different geographical and cultural regions. This was also expected to help in overcoming the problems encounter by cultural differences (Krishna et al., 2004; Mäkelä, 2006; Lucas, 2006; Minbaeva, 2005). Some of the long-term goals that pertained to salespeople's involvement in virtual teams were especially ambitious. For instance, virtual teams' salespeople were, in practice, responsible for exhorting other salespeople in their regions to adapt a more active behavior in their knowledge sharing. The aim was to create encompassing internal knowledge networks

Before starting their formal operations, each virtual team had an intensive training week in Finland. The purpose of that week was to orient and educate the team members to their new roles, but more importantly, to create trust and social bonds among the team members. Thus, the program designed by VI's project team included many shared social events, such as sauna evenings and cottage weekends. A special emphasis was given to intensive teaming up activities, because several studies (e.g. Jarvenpaa et al., 1998; Orlikowski, 2002) accentuate the role of face-to-face interaction in creating trust and joint identity among the team members. In addition to these team building efforts, training included lectures on knowledge management, class room exercises, and group discussions, all of which were arranged in Vaisala's headquarters in Finland. Overall these efforts were consistent with Rosen et al. (2006) who submit that virtual team training and team-building activities are essential for the success of virtual teams. At the end of their training virtual teams were asked to self organize their future face-to-face meeting and the virtual working in the portal. Some teams scheduled their next face-to-face meeting at the start up training sessions, others left it to be decided later in the virtual space. Practically all participants perceived these encounters as important.

Functioning of virtual teams and the Intranet Portal – Tools for knowledge sharing

> *".. Now having a whole group answering these questions… a lot more people answer and cover these questions than just direct email to one person"*

Simultaneously to building virtual teams, an intranet portal was created to serve as a knowledge sharing tool in virtual teams' ongoing interaction. Vaisala's project management designed the structure and contents of the portal, but its technical implementation was given to a specialized firm. The financial costs for the intranet portal remained relative low as it was not overly complex in technological terms and as its architecture had been designed in Vaisala. The portal was open to all VI employees, yet having some restricted areas for the team member use only. The portal consists of a discussion space to exchange knowledge on products and markets. The questions and answers and comments are thus open for all VI use. The team members and project team engaged in creating the first questions, answers and comments so that at the opening of the portal it would be of interest of all VI employees to start using it and to lower people's barriers to pose questions or comments that can be seen by all users of the portal. Also, a search function to retrieve previous discussions and comments by search words was created. This enabled easy handling of working with explicit knowledge, hence facilitating joint activities, such as awareness of new product characteristics or customers purchase, creating a common language and concepts (Horwiz et al., 2006) The project team had prior to the opening of the portal ensured that current product materials, procuress, product manuals etc. were included in the portal in easily accessible way.

The team members were introduced in the portal and some of their personal information added to lower the barriers for social interaction in the virtual setting. The restricted area allows the team members to meet virtually sharing knowledge that relates to the teams' workings. The restricted area also enables them to build a sense of community and allows social interaction and creation of deeper relationships found important in functioning of virtual teams (Peters and Manz, 2007). Moreover, the different spaces within the portal allowed learning to occur in various levels: individual, group and network (Crossan et al. 1999)

As soon as the intranet portal opened, virtual teams started to engage in creating content in it. The team members were charged with answering the questions processed through the system. The system displays how long a question has been waiting for an answer. In the beginning, the virtual teams created comments on identified information needs by themselves to create content in the portal. This has put the roles and efforts of the team members visible to all. In the interviews with the users of the system, this was found to have leveraged expertise, facilitated coordination, and helped to avoid redundancy and duplication of work as suggested by Duarte and Snyder (2001). These joint efforts to create content to the portal have also contributed to team identity positively and added cohesiveness as they were shared experiences empowering the teams rather than directly controlled by the upper management. Moreover, after virtual teams had created content in the portal, also employees outside the teams began using it for seeking knowledge and for posting their knowledge for other users of the portal. The portal created interest in the company management as well, which might have increased the teams' willingness to change to this new protocol in knowledge sharing.

However, the discussions in the portal turned out to be very task-oriented and did not include small talk or "stories" as such, which had been current in previous means of communicating, name phone calls and emails. These stories allowed passing on the learning experiences from e.g. customer calls. We could also detect somewhat differing views among the virtual teams on their aims and working. Members of some teams faced their new tasks enthusiastically having a very positive attitude, whereas people in other teams did not expect virtual teams to bring about many changes in VI's knowledge sharing. Some teams seemed to share a joint vision or goals about the new tasks at hand but in some other teams, people were acting, at least initially, more individually without having strong feelings of team affiliation. In particular, these differences were present between virtual teams that were formed around new product lines and teams around old product lines. As opposed to individuals in teams that were formed around old product lines, individuals in new product line teams tended to demonstrate higher levels of commitment to their teams and opted overall a more optimistic attitude towards the virtual team project. Furthermore, there were some differences among the virtual teams on whether they gave more emphasis on the team (socially oriented) or on the portal (task oriented) – some perceived their role more as adjunction to the portal, whereas others saw teams as the major issue and the portal as their tool. Next we shall proceed to present the key implications of the study.

Discussion and conclusion

This paper reports a case study on the role virtual teams augmenting knowledge sharing in Vaisala Instruments. In particular, the present study examines how virtual teams act as means exhorting all employees in the organization to participate in knowledge sharing activities. In this, virtual teams replaced VI's former knowledge sharing system that relied heavily on individual product line marketing people as knowledge providers. The purpose of the new, virtual team-based knowledge sharing system was to even out the burden on knowledge activism among a larger pool of employees, construct an extensive knowledge network that reaches a higher number of employees, and improve coordination among different functions, especially sales, product line marketing, and R&D.

In order to create a space for knowledge sharing, VI launched an intranet-based web portal where employees could freely interact, share their knowledge, and seek for an advice. A particular objective with the intranet-based portal was to enable not only sharing explicit but also tacit knowledge, at least among the members of virtual teams. For that purpose, web portal contained a special place for virtual team members where they could mingle informally

and express themselves more freely and personally. Furthermore, team building activities and team orientation before the launch of the portal contributed to mutual trust and cohesiveness that enabled the subsequent sharing of tacit knowledge. In practice, tacit knowledge shared among the team members embodied a more in-depth grasp of different local markets and how VI's technologies could be better matched with these heterogeneous market conditions.

As the case demonstrates, the portal became the most prominent forum for cross-functional and multi-locational knowledge sharing in VI. It was quickly adopted for use by virtual teams and also by other employees of VI. Virtual teams were thus successful in their task of exhorting also employees outside the teams to participate in knowledge sharing processes. The new knowledge sharing system ensures means and spaces for knowledge sharing at all levels: individual, group and the network (Crossan et al. 1999).

The results demonstrate that case company's head office is a knowledge hub where product line marketing people act as key knowledge activists. However, a lot of their time is consumed by repetitive knowledge sharing tasks. Hence, there was a need to develop means to enable these key persons to devote more of their time to new knowledge creation processes (cf. Cross et al., 2006). However, it revealed that the active relationships of a few individuals cover the distinct units at dispersed locations across the organization. The new knowledge process uses the internal knowledge network's knot people in virtual teams. Virtual platform was created to allow a companywide knowledge sharing in one joint space.

In VI it appears that particularly virtual teams that were formed around new product lines were willing and capable to exhort employees all over the organization to participate in knowledge sharing in the virtual space. Perhaps this is because these teams did not yet have strongly established knowledge sharing structures that would have been difficult to change. If this explanation holds, it may not be advisable to build virtual teams based that are too closely intertwined with established patterns of the organizational structure. However, we also discover that taking advantage of existing knowledge networks can benefit virtual teams, and they provide an already working platform or a spine to the team. Therefore, managers creating virtual teams always have to balance between the inertia that may lurk in the firm's existing knowledge networks and convenience that existing knowledge structures can bring about. In VI it seems that particularly new product lines with an already established knowledge network could strike the balance between these two.

The managerial contribution of the paper builds on these solutions made during our research process that enable a wider knowledge sharing through a virtual team structure. I addition, the studied case highlights the importance of internal knowledge networks as means for good and efficient customer care globally and as means to build the company's competitive edge towards its competitors. This case study puts forward at least three concrete implications that managers should consider when aiming to improve internal knowledge sharing through virtual teams. First, VI's case strongly suggests that virtual teams are effective conduits of knowledge in MNCs. This means that managers, who have not already done so, should find out whether and how they could utilize virtual teams in their organizations. Second, managers should leverage their organizations' existing knowledge structure and utilize employees that already play a key role in sharing knowledge. As this study shows, social network analysis provides a fitting tool for untangling these structures and identifying key actors the knowledge sharing processes. Finally, as VI's case indicates, training and team-building activities form a steady basis for the subsequent virtual knowledge sharing. Thus, while they probably consume both time and money, they are likely to turn out good investments as they improve trust, readiness to collaborate, and mutual understanding among the team members.

Analysis of the performance effects of the virtual team structure provides a fruitful area for future research.

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