

KNOWLEDGE SHARING THROUGH VIRTUAL TEAMS ACROSS BORDERS AND BOUNDARIES

Keywords: knowledge activists, virtual teams, multinational company

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This study focuses on a challenge faced by multinational corporations: how to enhance knowledge sharing across locational and functional boundaries. Through an in-depth qualitative analysis, this article illustrates how virtual teams augment knowledge sharing across geographically dispersed sales, marketing, and R&D units. Moreover, the present paper demonstrates how a multinational company can create effective spaces where their employees can both access knowledge and provide it to others, thus mitigating the negative effect of physical distance on the availability of support and information.

1 Introduction

Prior research has analyzed the key concerns in knowledge management, including the challenges of fostering knowledge creation and sharing through enabling interaction of different actors in the organization. Also, prior research underscored the need for creating spaces or communities that enable knowledge creation (Nonaka et al., 2000; von Krogh et al., 2001; Wenger and Snyder, 2000; Enberg et. al, 2006). Respectively, studies have noted 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; Troberg et al., 2002). The organizational capabilities to learn, assimilate, and create knowledge as well as the structures behind knowledge creation have also received considerable attention (Zollo and Winter, 2002; Jones, 2006).

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However, the role of individuals and teams as change agents, knowledge activist or facilitators of knowledge sharing has received less research attention than organizational structures. Knowledge activist can be defined as an individual or a group, whose task is to enhance knowledge sharing and creation (von Krogh, 1997). This is in spite that the salience of their role is widely recognized (e.g. von Korgh, 2001; Wenger, 1998; Cross et al., 2006; Jones, 2006; Mäkelä, 2006) This, study aims to fill at least some proportion of this gap by focusing on virtual teams as knowledge activist, as key actors in a new knowledge sharing program. The current article poses questions: “*What is the role of knowledge activists in knowledge sharing in multinational company?*” and “*How can a firm create means for more efficient way of recognizing key individuals for knowledge activist teams in knowledge creation process?*”). Townsend et al. (1998) point out that virtual teams have changed the corporate landscape of the twenty-first century, replacing traditional teams and enabling organizations to become involved in more complex and dynamic knowledge-intensive activities. Cascio and Shurygailo (2003) emphasize that work can now be conducted anytime, anywhere, in real space or through technology. Hence, through rapid technological advancements, virtual teams have led to a new paradigm of work.

In this study, we focus on the role of virtual teams as knowledge activists. Special attention is paid to the context of knowledge creation processes, in multitude of community of practices and multiculturalism. The main contribution of the study emerges from the conceptualization of virtual teams as knowledge activist and the demonstration of knowledge sharing through virtual teams within a multi-national organization, acknowledging the diverse nature of knowledge in this specific context.

2 Conceptual foundations

2.1 Concept of knowledge

The concept of knowledge has been conceptualized and categorized from many perspectives. Traditionally two streams on knowledge research have been presented: *cognitive and constructionist* (see von Korgh 1998). According to cognitive perspective knowledge is universal, and consists of explicit pieces of knowledge, objectively defined concepts and facts that are easily transferred from one person to another. Thus, the recipients of knowledge should be able to put together the very same jigsaw picture as hold by the knowledge provider. In contrast, constructionist perspective argues that knowledge is socially constructed and based on experience. It is not universal; but subjective, context-specific and relational, continuously re-created and re-constituted in social interactions (e.g. Nonaka et al., 2001; Swan et al., 1999; von Krogh, 1998; Tsoukas, 1996). As such, knowledge recipients always create different composition of knowledge than the knowledge provider because knowledge constructs differently based on each individual's prior knowledge and situational factors.

Tacit and explicit is probably the most used dichotomy dividing knowledge based on Polanyi's (1966) writings. Explicit knowledge is codifiable and something that can be put into words or numbers. Tacit element of knowledge is deeply rooted in an individual's actions and experience, as well as in the ideals, values and emotions he or she embraces

(see e.g. Nonaka et al., 2001; Takeuchi, 2001). Tacit knowledge might be something that we do not even realize we know. In this view knowledge always involves the knower, the individual who knows, such that knowledge is always constructed in the human mind, and not written on a piece of paper, for instance. “Knowing is a human act”, as McDermott (1999: 105) put it.

The question of the *locus of knowledge* has been of interest as well. Whether knowledge resides in individual, or can it be only revealed in a specific contexts emphasising the social nature, and the role of groups and communities (Lave and Wenger, 1991; Wenger, 1998) or could it reside even in larger setting, e.g. in networks (see Araujo, 1998; Bångens & Araujo, 1999; Håkansson et al., 1999; Knight, 1999; Håkansson, 1993; Lundvall, 1993).

Newell et al. (2006) present yet another classification, challenging the view of seeing knowledge as *possession* where individuals share and pass knowledge to each others. In their discussion, the authors present as an example, Nonaka and Takeuchi’s (1995) SECI model where individuals share explicit and tacit knowledge in knowledge creation process sharing their possession of knowledge (see also Nonaka et al., 2001). Seeing knowledge as possession seems to be dominant view, implicitly underlying most of the knowledge research. As opposed to this dominant view Newell et al. (2006) present knowledge as *practice or communal* where it is always jointly created in social interactions within a context, either through shared practices (e.g Gherardi, 1999) or in a community, or better communities of practice (e.g. Lave and Wenger 1991).

These key dimensions seem to create an understanding on knowledge as consisting of dichotomies or as build on distinct categories. However, we wish to build along the view presented by Newell et al (2006) following the work by Cook and Brown (1999) emphasising the intertwined nature of knowledge. Rather than building from categories or dichotomies knowledge contains different dimensions and categories simultaneously. However, to pinpoint some of the issues related to these dimensions identified in knowledge we analyse the intertwined categories through three verbs that each connote somewhat different view on knowledge, namely *transferring knowledge* (explicit emphasised, possession, cognitive view), *sharing knowledge* (emphasis on tacit, constructionist view, knowledge as a possession), and *joint creation of knowledge/knowing* (constructionist view, knowledge as a process, mutual know-how).

2.2 Knowledge activists

The literature on knowledge work recognizes the specific role of *knowledge activists*. Von Krogh (1997) introduces the concept of a knowledge activist describing an individual or a group, who can be considered as a type of a mediator in creating knowledge. The role of a knowledge activist is to bring different people and groups together (Käser and Mills, 2002). Based on case studies, Käser and Mills (2002) introduce the dimensions of motivation and trust as essential drivers contributing to the success or failure on the workings of a knowledge activist. They propose that intrinsic motivation and deeper levels of trust are needed for the knowledge activist work to promote knowledge sharing to succeed (von Krogh et al., 2000: 149; von Korgh, 1997; Jyrämä and Äyväri, 2007).

The role of a knowledge activist is not only to bridge between otherwise disconnected individuals but actively create spaces and occasions for joint actions, that is, to act as a catalyst of knowledge sharing and knowledge creation. Their role is also to bring together different functional departments or teams. Knowledge activist coordinate knowledge-creation build in different departments or teams. They also operate at the interfaces between users and producers of knowledge. Moreover, knowledge activist create a vision for the future, encouraging innovative activities. There are three possible tasks for knowledge activists: the catalysts of knowledge creation, coordinators of knowledge-creation initiatives, and merchants of foresight. These roles can be present simultaneously (von Krogh et al., 2000: 149; von Korgh et al 1997). For the knowledge creation processes to succeed and to enable the work of a knowledge activist, it is vital to create supporting organizational structures, employee roles and protocols (e.g. Käser and Mills 2002; Von Korgh et al., 2000).

2.3 Virtual teams

Challenges related to the knowledge sharing in the context of geographically dispersed organizations such as multinational companies have been investigated by several studies (e.g. Mäkelä, 2006; Lucas, 2006; Minbaeva, 2005; Troberg et al., 2002). As discussed in the previous section, the mainstream of knowledge management studies is linked to non-virtual situations such as creation of social ties, joint practices, norms, and building of trust. However, these concerns are especially pronounced in the virtual context, where the challenges can not be risen to in face-to-face interactions (Hinsz et al., 1997; Wenger and Snyder, 2000; von Korgh et al., 2000; Kirkmalet al. 2002). Virtual teams have been presented as one solution to the challenges facing multinational companies. 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). As technology has improved and collaborative software has been developed, virtual teams of 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 VT interaction.

The 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., 2006–2007; Mihhailava, 2007). There are many potentially important factors that could impact virtual teamwork in various ways. In the literature, these include *trust* (Jarvenpaa et al. 1998), *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 very 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. To conclude, prior research (e.g. Jarvenpaa et al, 1998; Liedtka, 1996; Peters and Manz, 2007) show 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.

To summarize, knowledge sharing is difficult, especially when wishing to share knowledge in its all intertwined forms; to transfer, share and jointly create knowledge. 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 that we discuss above suggest, there possibly are means to transform virtual teams into effective knowledge sharing conduits. In that, we particularly emphasized their role as knowledge activists who can help to create a trusting community atmosphere within the virtual context and spur others to share their knowledge. 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, and trust. 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 as knowledge activists and identify means for firms' to recognize and use knowledge activists in knowledge creation and knowledge sharing processes.

3 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 % 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%) 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 centered 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.

4 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 the role of communities and knowledge activist 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, 28 sales person were conducted the teams were interviewed either each member individually or as a group; (5 individual interviews/ team one and 4/team four,) two teams were interviewed as a group (6 persons/team two; and 8/ team 3). We also had access to see virtual teams in work by observing the created portal in connection to project team meetings. 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	Interviews of key actors Discussion within the company and projects team	Nature of knowledge Knowledge sharing models Previous experiences from research
Establishing teams	Interviews SNA	Knowledge activist Virtual teams Communities
Functioning of teams	Interviews Observations	Virtual teams Knowledge sharing

5 Discussion on findings

5.1 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 has long been among the best performers in its industry, its internal knowledge sharing system was considered to need 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. On the other hand, product marketing personnel was not completely satisfied with the amount and the quality of customer information and product feedback that they got from 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. 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. Facing current problem encountered in knowledge sharing among different communities (e.g. Lave and Wenger, 1991; Horwiz et al., 2006) 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. Jarvenpaa et al., 1998; Lave and Wenger, 1991).

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 have the best knowledge on these matters, so they 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. 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 began, 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. These individuals acted as knowledge activist, yet without the status and resources allocated for it. This kind of sparse network involved several risks and disadvantages for VI's knowledge sharing and did not support the working of knowledge activist (see e.g. von Krogh et al, 1997; Käser and Mills, 2002). 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 knowledge activists 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. 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).

5.2 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. The aim was to include all knowledge, to be able to create a culture of jointly creating new knowledge, not seeing the knowledge as possession or tool of power, openly sharing both tacit and explicit knowledge (e.g. Newell et al., 2006; von Krogh et al., 2000). Project teams also wished to build on the people's interaction rather than on pure information system (Newell et al., 2006; Nonaka et al., 2000). The main goal with virtual teams was that they replace individual project line marketing people as the primary mediators and providers of knowledge. In other words, the goal was that teams become knowledge activists (von Krogh, 1997), 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).

5.2.1 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. In other words, the aim was to identify the individual natural or organizational knowledge activist. 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.

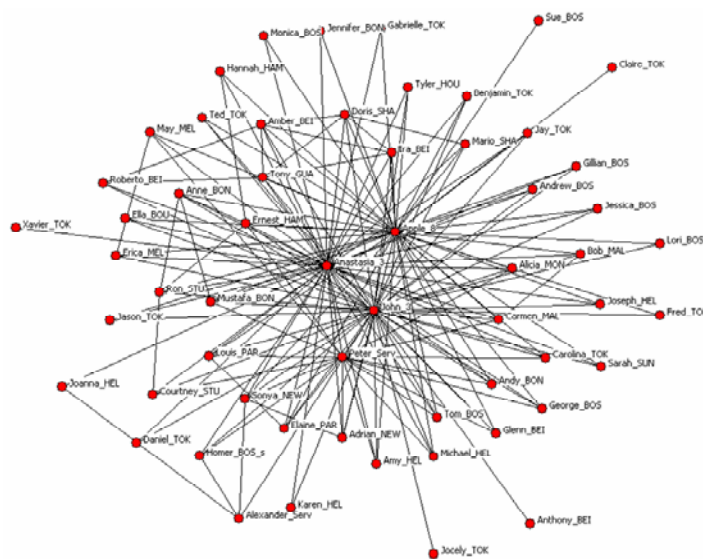


Figure 1 A product line knowledge network

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 were 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.

5.2.2 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. They were allocated two tasks of knowledge activist, being a catalyst and mediator for knowledge sharing (e.g. von Korgh et al., 2000).

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. 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 session, others left it to be decided later in the virtual space. Practically all participants perceived these encounters as important.

5.3 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. 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. The style of discussion was aimed to be informal yet accurate. This encouraged to view knowledge communal rather than possessions (Newell et al., 2006). 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. This diminishes also the problems encountered on differing memories (Hinzt et al., 1997) facilitating the shared practices and creating a common language and concepts (e.g. Lave and Wenger, 1991; 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).

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. The more formal way of communicating might impede the sharing of tacit knowledge, which was found important by the team members. (e.g. Nonaka et al., 2000). We could also detect somewhat differing views among the virtual teams on their aims and working. Members of some teams faced their new tasks working as knowledge activists 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. The orientation might influence the type of knowledge processes, transferring, sharing or jointly creating knowledge in the teams and in the portal (e.g. Cook and Brown 1999). Next we shall proceed to present the key implications of the study.

6 Conclusions

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 knowledge activists 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. As the case demonstrates, the portal served its function and 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 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 – knowledge activist – 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 these knowledge activists in virtual teams. Virtual platform was created to allow a companywide knowledge sharing in one joint space.

Moreover, this study shows that virtual teams can act as knowledge activists. In VI it appears that particularly 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 structures 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 structures 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.

This article elaborates these specific activities highlighting the interplay of activities and the underlying understandings of knowledge. Our results suggest it is important to carefully and sensitively reflect and ponder the on the nature of knowledge as this influences the perceived choices and needs for actions. Time and space should be created for this type of reflection both in the planning and in the implementing stages: contexts participants can share their understandings on knowledge and reflect how this applies in practices.

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

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