Managing Structural Diversity: the Case of Boundary Spanning Networks

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Abstract. This paper reports from an interpretive case study conducted in a multinational company that operates in the marine insurance industry. The study focuses on how structural diversity influences knowledge work activities performed by participants who are members of distributed networks of practice (DNoPs). In this paper, a DNoP is defined as a loosely knit, geographically dispersed group of participants who share knowledge with the purpose of solving business problems and improve daily work practices within an organization. The paper takes the view that dimensions of structural diversity such as geographical dispersion, business functions and business divisions define internal organizational boundaries. Thus, knowledge sharing in structurally diverse networks may be less efficient due to the barriers that these internal boundaries may cause. Structural diversity, however, may also enhance creativity and innovation where radical new insights arise from different perspectives introduced by the participants. Consequently, diversity and its potential boundaries embed a duality of contradictory features.

The interviewees who participated in this study regarded diversity as a valuable resource. Different perceptions of business concepts, however, caused misunderstanding and conflicts between participants who worked at different business divisions and thus were geographically dispersed. Interesting findings demonstrated that the DNoPs under study went through an evolution where participants enacted through boundary spanning activities to overcome the barriers that structural diversity caused. The role of knowledge brokers and the use of boundary objects were crucial in these activities. While some boundary objects acted as obstacles, unexpected and illogical objects emerged from practice and became the most efficient boundary objects in use. Different communication media such as video- and teleconferences, email and intranet supported the boundary spanning processes. This paper brings the insight that networks were transformed by the influence of diversity, and that knowledge practices within the networks supported a shift as the networks evolved through cross-network interactions.

Keywords: Network of practice, knowledge sharing, structural diversity, boundary object, boundary spanning, knowledge broker.

1. Introduction

The stream of knowledge management (KM) literature has paid increased attention to informal organizational groups like communities of practice (CoPs) and networks of practice (NoPs), and their significance for knowledge sharing, learning and innovation (Brown and Duguid 2001; Wenger 1998). CoPs and NoPs are emergent and self-organizing groups that represent "invisible" relations existing *beside* the formal organizational structure (Brown and Duguid 1991; Lave and Wenger 1991). They create veins for knowledge flows and a "tighter" organization by integrating different business divisions and geographical locations in multinationals companies (Hansen 1996).

Achieving efficiency in distributed knowledge work activities is, however, challenging. By their very nature, multinational enterprises comprise organizational members from various nationalities, cultures, and demographic backgrounds. These employees are from a number of organizational functions, divisions, and hierarchical levels, thus leading to high degrees of diversity within the organization. A number of studies on distributed multinational teams and workgroups have found that a high degree of team heterogeneity may cause challenges in developing group cohesion, shared identity and collaboration know-how across geographical and organizational borders (Earley and Mosakowski 2000; Fiol and O'Connor 2005; Maznevski and Chudoba 2000). Interaction problems are also associated with diversity, leading to conflicts and communication breakdowns in groups' relationships (Cox and Blake 1991). Thus, it has become important to understand how compositions of different organizational groups may affect knowledge sharing, creativity and organizational outcomes (Cox and Blake 1991; Cummings 2004; Van der Vegt and Bunderson 2005).

While several research studies have focused mostly on demographic and cultural diversity, only a few studies have paid attention to *structural diversity* in terms of e.g. organizational role, geographical location, functional assignments and business units (Cummings 2004; Majchrzak et al. 2005). In one study, structural diversity was found to cause challenges in terms of increased misunderstandings due to divergent perspectives (Jehn et al. 1999). However, Cummings (2004) manifested contrary results in a study on dispersed work groups where higher degrees of structural diversity where associated with higher value of external knowledge sharing and increased performance. Building on former research results in work groups

and teams, the argument in this paper is that structural diversity in a distributed network of practice has a potential for becoming a resource of creativity and innovation if the competence of managing and utilizing this opportunity is present among the members of a network. The limitation of research that specifically investigates structural diversity and its relation to knowledge sharing within distributed networks of practice (DNoPs) motivates this research. Thus, the research question addressed in this study is how DNoPs can *manage* the effect of structural diversity to achieve efficient knowledge sharing among participants that work geographically dispersed from one another.

Previous research that has examined transformation of knowledge at different cross-functional boundaries primarily pay attention to integration of interdependent sequences and stages within production (e.g. Bechky 2003; Carlile 2002). The interest of this study, however, relates to knowledge activities at cross-functional and geographical boundaries between communities without requirements of coherence as such.

To investigate how members of knowledge sharing DNoPs managed the effect of structural diversity, we conducted a case study in a small multinational firm operating in the marine insurance industry.

Although the interviewees considered diversity as a valuable organizational resource, to utilize this opportunity represented quite a challenge. Frictions because of different business language across different divisions led to conflicts between different networks. Proposals of cross-network interactions were important in order to manage the effect of diversity. In these initiatives the role of boundary spanners (Ancona and Caldwell 1992), knowledge brokers (Brown and Duguid 1998), and boundary objects (Star 1989; Star and Griesemer 1989) were identified as critical.

The paper is organized as follows. Section two introduces the concepts of DNoP, structural diversity, boundary spanning concepts and related research studies. Section three presents the research site, method and data collection techniques, and section four presents the findings from this study. Finally, section five provides a discussion and some concluding remarks.

2. Distributed networks of practice

CoPs and NoPs are groups of individuals connected together through social relationships that emerge as individuals interact on task-related matters when conducting their work (Brown and Duguid 1991; 2001; Lave and Wenger 1991).Researchers have investigated different forms of these networks of practice in several settings, with CoPs being the most well-known research concept. A community of practice consists of a tightly knit group of members engaged in a shared practice who know each other and work together, typically meet face-to-face, and continually negotiate, communicate, and coordinate with each other directly in course of their work (Brown and Duguid 2000: 143). In contrast to a co-located CoP, a DNoP consists of a larger, more loosely knit and geographically dispersed group of participants engaged in a shared practice or common topic of interest (Hustad and Teigland 2005; McLure Wasko and Faraj 2005; Teigland 2003). DNoPs use a variety of electronic channels to communicate and share knowledge (Hustad 2006). Examples are video- and telephone conferences, instant messaging, e-mail, intranets and knowledge repositories that support transmitting and receiving of information.

In this paper, the context of a DNoP is considered as a dynamic relationship of members who interact primarily through electronic means from across co-located CoPs involving two or more locations. Since several communities of practice may be represented in a DNoP, this type of network represents an inter-community structure (Hustad 2007). Due to the physically distributed nature of networks of practice, the ties linking the members together are generally weaker in terms of lower degree of involvement, lower emotional intensity, intimacy, and reciprocity. Moreover, knowledge is less redundant in a distributed network since new insights and perspectives from different environments might stimulate the diffusion of new creative ideas (Granovetter 1973).

2.1 Structural diversity

Researchers have proposed that DNoPs may facilitate more innovative knowledge activities than CoPs since their members may have a more extensive network of both internal and external contacts (Brown and Duguid 2001). This is reflected in the research on formal groups such as teams and workgroups and particularly that which examines diversity in such settings. In this literature, numerous different definitions of diversity have been put forth; however, they generally distinguish between two main sets of characteristics: 1) diversity of observable or visible detectable attributes such as ethnic background, age, and gender, and 2)

diversity with respect to non-observable, less visible or underlying attributes such as knowledge disciplines and business experiences (Jackson et al. 1995; Milliken and Martins 1996).

Researchers have tended to focus primarily on the first category of diversity in terms of its effect on communication, conflict, and social integration processes and have paid relatively little attention to diversity in terms of organizational affiliation, geographical location, role, or position (Cummings 2004; Maznevski 1994). However, one study of dispersed workgroups in multiunit organizations found that the latter form of diversity, labeled *structural diversity*, was more strongly related to effective knowledge sharing and workgroup performance than demographic diversity (Cummings 2004). Although the study identified four types of structural diversity: 1) geographic, 2) functional, 3) reporting managers, and 4) business units, the common denominator of these four types is that each leads to the possibility of increased access to diverse social networks which provide unique information, expertise, and feedback. These findings are supported in other studies of diversity, and the argument is that interaction between individuals with different expertise and divergent perspectives is a key source of learning and innovation (Majchrzak et al. 2004). As mentioned in the introduction, however, interaction problems are also associated with diversity, leading to frictions, and fragmentation in groups' relationships (Cox and Blake 1991; Jehn et al. 1999).

Similar to dispersed workgroups in multi-unit organizations, DNoPs in a multinational organization would be characterized by a high degree of both demographic and structural diversity that is expected to have an impact on knowledge activities. In contrast to formal workgroups and teams being designed by management, however, DNoPs are emergent with individuals forming relationships based upon mutual interests and shared work practices. Building on related research of structural diversity within workgroups (Cummings 2004), it is of interest to investigate structural diversity in somewhat different perspective by utilizing the concept of a DNoP.

2.2 Boundary spanning concepts

In this paper, the argument is that structural diversity may create internal boundaries within DNoPs. These boundaries represent both barriers and opportunities for creativity and efficient knowledge sharing between dispersed participants. For instance, while knowledge sharing inside a practice of a community or a network seems unproblematic, the transfer of knowledge becomes more complicated across practices (Bechky 2003; Carlile 2002). The dynamic interaction *between* different communities, however, seems to stimulate the emergence of new configuration of knowledge and innovation. Boland and Tenkasi (1995) define *perspective making* within a community of practice as the ability of participants to develop a strong core practice by strengthening their own knowledge domain within a community. *Perspective taking* is when a community manages to *translate* the practice perspective of another community by framing the elements from this worldview into its own worldview and utilize this additional knowledge in their activities.

Boundary spanning involves activities that occur at internal or external boundaries of organizations. Boundary spanning may facilitate knowledge translation across business divisions, geographical locations and diverse practices within an organization. In the field of KM, the focus has been on individuals who occupy boundary spanning roles through facilitating communication and sharing of expertise by linking groups who are separated in terms of location, division or function (Levina and Vaast 2005; Pawlowski and Robey 2004). Knowledge brokers are individuals who participate in multiple communities and facilitate knowledge transfer among them (Brown and Duguid 1998). Brokering enables connections between communities through participants who introduce elements of one practice into another (Wenger 1998).

Boundary objects may act as the nexus of perspectives that need to be coordinated across diverse practices of multiple communities (Wenger 1998). The concept was originally introduced by Star and Griesemer (1989) to address the problem of how members of different social worlds interact. They define these objects as:

> *"Boundary objects both inhabit several intersecting worlds…and satisfy the informational requirements of each of them. Boundary objects are objects, which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual-site use. These objects may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting social worlds" (ibid.: 393).*

Moreover, effective boundary objects are those which are embedded in the practice of agents who use them and have a common identity across practices (ibid.).

In information systems (IS) research, a broad range of information and communication technological (ICT) artifacts have been classified as boundary objects. Examples are intranet applications (Levina and Vaast 2005), enterprise resource planning system (Pawlowski and Robey 2004), and repositories (Carlile 2002). ICT artifacts may act as boundary objects in a DNoP by becoming a part of a network's shared repertoire[1]. This paper utilizes the notion of structural diversity in combination with the concepts of boundary spanning introduced in this section as a contribution to increase our understanding of structurally diverse DNoPs. Hence, managing structural diversity is in this study is considered as a boundary spanning process where different dimensions of structural diversity constitute a boundary in which members are separated by either location or both location and business functions. The challenge is then to facilitate knowledge sharing of expertise that exists at each boundary.

3. The case study of Insure

Insure (pseudonym) is a small multinational firm operating in the marine insurance industry. After an organizational merger between departments from two other companies, Insure today has three different business divisions and provides claims handling and underwriting activities for ships owners (P&I division), the hull and machinery market (Marine division), and the oil and gas industry (Energy division). Insure has approximately 350 employees working in ten different locations of Europe, Asia and America. In addition, numerous correspondents assist Insure with their local expertise worldwide.

Insure needed to go through an organizational change from being a monolithic organization representing one business division towards a heterogeneous company consisting of three different business divisions of marine insurance. Dispersed organizational members needed to communicate frequently to ensure integration and transformation of knowledge to develop a more holistic understanding of different business concepts of marine insurance.

An interpretive case study was conducted to examine the effect of structural diversity on knowledge activities within DNoPs. In addition, this exploration concerned how the members managed and utilized the effect of structural diversity by enacting in boundary spanning activities. A case study approach was chosen because of the importance of studying networks of practice in their real-life context (Yin 2003). Secondly, a case study was appropriate since the existing body of research and literature did not adequately describe the phenomenon under investigation (Eisenhardt 1989). Finally, a case study provides a comprehensive in-depth study and a rich picture of one organization in which all the specificities that are unique for that particular organization are looked into more carefully (Stake 2000).

The collection of empirical evidence took place in five organizational sites of the company (three offices in Norway, one office in England and one office in Finland) during the period from autumn 2003 to spring 2006. The data collection comprised approximately thirty in-depth, open-ended and semi-structured interviews, and observation of internal organizational videoconferences and open-ended email-discussions in different DNoPs. The interviewees were from different hierarchical levels (operational and management), different business divisions, business functions and knowledge disciplines (lawyers, mariners, engineers, financial experts, IT-personnel, managers and knowledge officers). Secondary material was collected from the company's intranet consisting of internal reports, presentation materials, workshop reports, meeting agendas, meeting minutes, and internal documents. In addition, detailed information from the company's 'yellow pages' gave information about the organizational members' diversity in terms of their educational background, competencies, and their hierarchical position (role, division, function, department, location). Document analysis provided important contextual information of the company's organizational formal structure, policies, knowledge management strategies, competence development, quality management routines, day-to-day events, policies, and work practices. The process of data collection and analysis proceeded iteratively, allowing themes to emerge from the empirical material for categorizing, and then to be examined more deeply according to its relevance.

4. Findings

Several DNoPs were identified during the investigation. In this study, two different categories of DNoPs are presented and compared in terms of how structural diversity is managed. These categories represent the main business activities in the company regarding of claims handling and underwriting. The degree of members' diversity in these networks varied. Both heterogeneous and homogenous networks existed and

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[1] See Wenger (1998: 73) who defines different dimensions of practice as the property of a CoP.

they crossed boundaries of different diversity dimensions; geographical locations, business divisions, business functions, knowledge disciplines and organizational roles. However, as mentioned in the introduction, structural diversity dimensions in terms of geographical dispersion and business functions are the main foci. With the exception of one network (the Energy Underwriters), all of the networks of practice studied, were crossing boundaries of geographical locations.

Table 1 presents the findings related to structural diversity dimensions and boundary spanning activities within the *claims handling* and the *underwriting networks*.

Table 1: Structural diversity and boundary spanning in networks of practice

Networks of practice	Structural Diversity	Communication media	Efficient boundary objects	Less efficient boundary objects	Knowledge brokers and boundary spanners
P & I Underwriters	27 participants 14 core members 3 locations 1 business function 1business division	Video conference Email	Target list Market prospect	QMS	Carol
Marine Underwriters	42 participants 24 core members 6 locations 1 business function 1business division	Video conference Email	Target list Market prospect	QMS	Carl
Energy Underwriters	15 participants 15 core members 1 location 1 business function 1 business division	Face-to-face Email	Not identified	Not identified	Carl
Joint Underwriters	84 participants 53 core members 7 locations 3 business functions 3 business divisions	Face-to-face Email	Target list Market prospect	QMS	Carol Carl
Joint Claims handlers	27 participants 14 core members 7 locations 4 business functions 3 business divisions	Telephone conference Email Face-to-face	Intranet, DMS, KMD, Standardized terms	Not identified	Chris

In the following sections, the findings from these networks are presented respectively.

4.1 Underwriting networks

Three different NoPs were identified in this category representing the business functions of P&I, Marine and Energy underwriting respectively (table 1). The P&I and Marine underwriters are geographically dispersed. These networks communicate and share knowledge through weekly videoconferences for each business division. The Energy underwriters are co-located. All three networks have email lists for distributing information to their own group.

Participants from each underwriting network discuss business practices and daily work activities connected to underwriting issues of P&I, Marine or Energy respectively. The main purpose of each network is to share common interests regarding global market trends of maritime underwriting by exchanging market information and individual experiences related to strategies for "taking control of the market". The networks' shared repertoires represent a high degree of tacit knowledge in terms of unwritten artifacts and narratives, which were difficult to translate into explicit modes due to their improvisational and less standardized ways of working.

The company wants to utilize opportunities for cross sales across business functions to achieve synergies. A combination of P&I, Marine and Energy insurances might be of interest for customers who operate in different markets.

4.1.1 Conflict and misunderstanding between P&I and Marine Underwriters

To meet requirements for cross sales after the merger, the P&I underwriters recommended some of their clients as potential customers for the Marine underwriters. However, in beginning this became a challenging and conflicting process due to lack of understanding for each other's business practices. The marine underwriters refused P&I clients without giving reasons. The conflict went on unresolved for some months before a mutual understanding across practices were achieved. The marine underwriters have other strategies, routines, customer profiles and selection criteria for their customers compared to the P&I underwriters. While the Marine underwriters operate in a commercial market, the P&I underwriters' practices build upon a non-profitable mutual insurance principle to protect ship owners in the P&I club. In addition, the Marine and P&I underwriters' market targets did not always represent an overlap of common interests.

4.1.2 Managing structural diversity

To avoid conflicts and gaining a common ground of understanding, three different initiatives were implemented to stimulate knowledge sharing and collaboration across different underwriting networks. The aim was to achieve synergies across practices. We refer to these initiatives as *joint underwriting activities.* By organizing these joint activities, the different underwriting networks managed to reduce the problems diversity caused by building trust and a common identity across networks.

4.1.3 Joint underwriting meetings

After the merger, the members of different underwriting networks meet in joint gatherings twice a year. One important goal of these meeting is to increase the basic competence about each others underwriting practices. To provide knowledgeable information to customers, a Marine or Energy underwriter must know basic elements and principles of P&I underwriting and visa versa. The aim for each network, however, is not to achieve high expertise in all three practices of P&I, Marine and Energy, but to reach a basic level of knowledge of the other practices while still advancing within the boundary of their own practice.

During these meetings, underwriters from the different networks present experiences related to their strategies, market targets, guidelines and underwriting criteria. These presentations became a part of the repository as PowerPoint files accessible from the company's intranet. Sometimes in combination with the joint underwriting meeting, or in separate meetings, all the members from the P&I underwriting network who are daily located in Norway and England meet physically to discuss their renewal strategies of clients' accounts. In addition, people from some of the branch offices such as Hong Kong, New York, Helsinki and Gothenburg also participate in these meetings. They participate because they are involved in the support of marketing activities in these areas, and are involved in development of prospects. The underwriters need to prepare presentations beforehand, and in the meeting they need to defend their suggestions for renewals and the proposed increases in premiums. This is arranged as an exercise to learn from the other underwriters' individual strategies. In addition, each underwriter must get their suggestions of renewals approved from two other underwriters. These exercises were appreciated as useful among the participants.

4.1.4 Joint underwriting geographical teams

Cross-functional work does not always result in establishment of common clients, since the members of the different networks have different criteria when they are searching new markets. The Energy business division which operates in the oil- and gas industry does not lend itself that easily to coordination. However, there are a lot of opportunities there too, and the members of the Energy underwriting network have a long experience in their field and have contributed with valuable product information to the P&I underwriters on related insurance covers in product development.

Establishing "Joint underwriting geographical teams" is one important initiative to facilitate cross-sales across all three divisions. The underwriters from different business units participate in cross-functional geographical teams where each team is responsible for the marine insurance market in a particular geographical area. Each team has created an email list for discussion purposes. The aim is to identify common target lists of customers and market prospects of similar interest within the geographical area belonging to a specific team. Furthermore, this initiative ensures a tighter collaboration between underwriters from different functional areas. By organizing these team structures, the three different underwriting networks are building trust by getting to know each other better.

4.1.5 Joint underwriting traveling activities

In addition to joint underwriting meetings, the underwriters belonging to a particular geographical team jointly arrange traveling activities for visiting customers. For example it is sometimes useful for a P&I and hull underwriter who share interest in the same market, to do marketing preparation and visits together.
Thus, P&I and Marine underwriters, who share the same market interests, pay common visits to customers as a way of learning each other's business practices. When a Marine underwriter visits his or her customer, the P&I underwriter is a "passive observer" in that particular meeting and visa versa. Gherardi and Nicolini (2002) refer to this activity as "looking and seeing" which is fundamental in learning of a practice, and for absorbing tacit knowledge across practices.

4.1.6 Boundary spanning activities

The study identified boundary spanning events where different boundary spanners and knowledge brokers were important for translating knowledge across boundaries of structural diversity. Moreover, the networks applied different kinds of boundary objects (table 1). One of the managers, Carl (pseudonym) who is located in two of the business divisions (Marine and Energy) acted as a boundary spanner across these divisions. In addition, he visited the third division regularly, and was involved with traveling activities to the branch offices. As a manager, Carl is not directly involved at the operational level of Marine and Energy, but he sometimes participates in the Marine underwriters' video meetings. He has been involved in the initiative for establishing joint geographical teams on the strategic level.

Carol (pseudonym), is a lawyer working in the P&I division, and has a role as a knowledge broker. She participates in multiple CoPs and DNoPs, and in joint underwriting meetings. She has established contacts with underwriters from both the Marine and Energy divisions to bring forth new product ideas and potential cross sales.

The most striking boundary objects which emerged among the different underwriting networks were their common target lists, market prospects which represented "illogical" boundary objects (Star 1989). The quality management system (QMS) and the underwriting guidelines, in addition to presentations at common gatherings, where characterized as less effective boundary objects among the participants. According to the informants, QMS was more interfering with than supporting their knowledge activities. The network's common ground contained a high degree of tacit knowledge and "unwritten" artifacts[2] taken for granted such as narratives, symbols and jargons. Documentation according to QMS requirements did not correspond to the underwriters' improvisational ways of working.

4.1.7 Joint underwriters

Over time, a new *joint underwriting network* emerged consisting of underwriters from P&I, Marine and Energy business divisions (table 1, figure 1). The new network emerged through cross-network interactions encouraged by the three joint underwriting initiatives. These implemented initiatives were important for managing and utilizing the effect of diversity. According to Boland and Tenkasi (1995), the emergence of *joint underwriting* symbolizes a process of "perspective taking" (figure 1).

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[2] See McDermott (1999) regarding the use of "unwritten" artifacts in CoPs.

Geographical locations: A, B, C, D, E, F, G

Boundary objects: b1, b2, b3

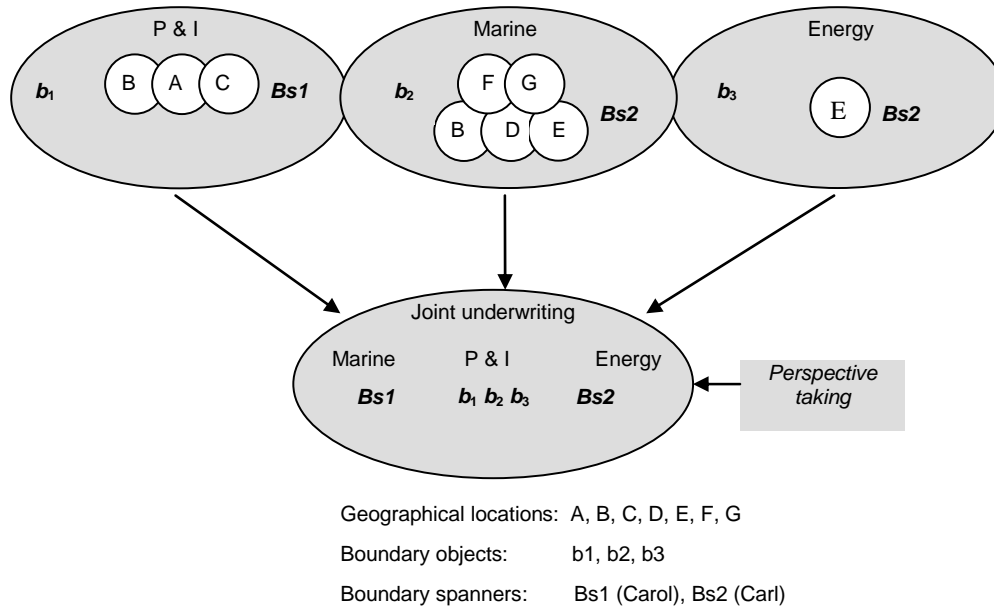Boundary spanners: Bs1 (Carol), Bs2 (Carl)

Figure 1: Emergence of the network of joint underwriters

During interaction in distributed video conferences, each of the functional underwriting network is involved in "perspective making" activities, whereby the network develops and strengthens their own knowledge domain and practices. As a perspective was strengthened, it became more complex; however, each network's knowledge activities improve. Through the process of "perspective taking", different functional networks meet and communicate by taking into consideration each network's unique world of thoughts. In order to integrate knowledge through perspective taking, communication systems must first support diversity of knowledge through the differentiation provided by perspective making within each of the networks of practice.

While different artifacts had potential features for becoming a boundary object embedded in practice across these networks, rather new and unexpected artifacts did emerge as the most critical objects for balancing structural diversity through cross-network interaction.

4.2 Joint claims handling network

The claims handling network has a high degree of structural diversity (table 1). The network encompasses geographically dispersed members from all business divisions. Before the company merger, the network consisted of members from the P&I functions only. Claims handlers belonging to the Marine and Energy divisions, however, became members in the network soon after the merger. The change of the composition within the network further increased the diversity since both new business practices as well as different organizational cultures were introduced. The members from the different business divisions carried divergent viewpoints and procedures for claims handling. These different perspectives brought dissimilar professional terms together. It was important to manage this diversity to uniform claims handling processes by utilizing and combining the different knowledge bases that existed in each of the business divisions.

The network's coordinator organizes telephone conferences every week where members of all business divisions participate. These participants are located at seven different geographical sites. During the telephone conference, one participant makes meeting notes and records these notes as a knowledge management document (KMD) in the document management system (DMS). Thus, an electronic 'meeting book' is accessible from the intranet.

Twice a year, the members of this network meet in joint gatherings to discuss challenges of claims handling. For instance, they discuss how to achieve a consistent and standardized claims handling process across locations. The organization wants to avoid development of local routines and rules for claims handling at each geographical location. To achieve this consistency, equal access to information resources independent of location is important.

Members from different geographical offices held presentations in these meetings, thus the whole network gets an overview of local competencies at each site. It is important for the members to be aware of the professional and local competence at each site to establish contact points across the organization. These

meetings are particularly important for members located at the branch offices since they might have limited access to common resources of the information infrastructure because of limited line capacities of the network technologies.

4.2.1 Boundary spanning activities

Chris (pseudonym) is the coordinator of the network and acts as a knowledge broker. He stimulates collaboration across networks of claims handlers belonging to P&I, Marine and Energy respectively. He utilizes the advantages of structural diversity. This is in accordance with Wenger's (1998) definition of brokers where individuals enable connections between different CoPs by introducing elements of one practice into another. Chris is a manager of joint claims in addition to be a line manager at the operational level of P&I claims. He started joint claims meetings soon after the organizational merger by organizing distributed weekly telephone meetings, and joint claims face-to-face meetings. He was active in the process of translating different business terminologies and business practices across functions by standardizing the terms to give them a common identity across business divisions. Additionally, as a coordinator of the network, he acts as a motivator for managing diversity by crossing boundaries of both geographical locations and business functions. Since he is a member of the top management group, he also has strategic and political motives for establishing the joint claims network since this is important for the overall business performance. In this sense, he has a role of a boundary spanner linking groups or communities separated by hierarchy, locations and functions. He acts as a scout by bringing information and resources into the joint claims network, or as an ambassador in terms of strategic, political interests (Ancona and Caldwell 1992).

The DMS is an example of an ICT artifact, which became a boundary object in use. The DMS artifact is a repository of shared documents that supports the management of diversity by creating a basic understanding across functions and distances in the claims handling network. Different KMDs represent belonging artifacts that became locally adapted and used by members at different geographical sites of the network.

5. Discussion and conclusions

Structural diversity causes both challenges and opportunities when knowledge crosses boundaries of practices and distances within distributed networks. By participating in DNoPs, structurally diverse members from various communities bring along different perspectives, which provide opportunities to create new knowledge through translations. Interesting findings demonstrated how participants in DNoPs managed and utilized the effect of diversity through boundary spanning activities that ensured efficient knowledge sharing.

Insure needed to go through an organizational change from being a monolithic organization representing one business division towards a heterogeneous company consisting of three different business divisions of marine insurance. Dispersed organizational members needed to communicate frequently to ensure integration and transformation of knowledge to develop a more extensive understanding of the overall business concept, which became more complex and diverse after the merger. Interesting findings demonstrate how participants in DNoPs managed and utilized the effect of diversity through boundary spanning activities that ensured efficient knowledge sharing.

Findings indicate that the networks were transformed by the influence of structural diversity, and that the knowledge practices of the networks supported a shift as the networks evolved. The role of knowledge brokers, boundary spanners and boundary objects were critical in this evolution encouraged by cross-network interactions.

According to Boland and Tenkasi (1995), it is through cross-community interactions that new configurations of knowledge emerge (Boland and Tenkasi 1995). Interpreting the languages across different communities, however, requires translation and transformation of various professional terms to create a basic common ground of understanding. In this study, boundary spanners, knowledge brokers and boundary objects were crucial for this translation and acted as agents that made local knowledge developed in one network graspable within another network. Former research has documented that boundary objects may support the understanding across different functional CoPs (Bechky 2003; Carlile 2002). A DNoP, however, has an inter-community structure, which represents a higher complexity than a single CoP. Knowledge sharing within a DNoP represents cross-community interactions, but findings from this study demonstrate *cross-network* interactions as well.

The networks managed structural diversity by applying boundary objects that reduced the ambiguity of knowledge interpretations and enabled tacit knowledge translation related to marine insurance practices.

Different communication media such as video- and teleconferences, email and intranet constituted an ICT infrastructure that supported the boundary spanning processes within and across different DNoPs.

Findings demonstrated both negative and positive effects of structural diversity. The negative effects of diversity were observed among the underwriters that experienced misunderstanding and conflicts. Different procedures for meeting the market needs made collaboration across underwriting networks challenging. Over time, however, diversity became a source of creativity as the participants managed diversity by enacting in boundary spanning activities that ensured efficient knowledge sharing. Joint underwriting activities were established in terms of cross-functional meetings, teams and travels. These initiatives increased the synergies across business functions and geographical locations of Insure and resulted in evolution and integration of different marine insurance practices.

Managing structural diversity to achieve translation and combination of knowledge across the underwriting networks seemed to be more complicated than for the various claims handlers. While claims handlers from different business divisions created a joint network just after the merger, the emergence of a joint underwriting network was more time-consuming. The network of claims handlers had a strong coordinator (Chris) who triggered the management of diversity and integration of practices. The underwriters did not have a permanent coordinator and their work routines had a more improvisational and unwritten nature. In addition, the pressure regarding cross sales caused conflicts that required both time and creativity to solve.

The joint claims network used ICT artifacts to manage their structural diversity of geographical dispersion and cross-functionality. The claims handlers had regular distributed telephone meetings and created KMDs by using the DMS as a boundary object. In comparison, the underwriters applied other types of boundary objects such as target list and market prospect that supported mostly the translation between different business functions. These boundary objects emerged from practice and were rather illogical boundary objects. QMS represented a logical boundary object that could tie underwriters from different functions together. However, QMS did not meet the requirements of adaptability and flexibility for being a boundary object for the underwriters. The participants evaluated this object as inefficient since it tended to be more interfering with than supporting the accomplishment of work tasks.

The findings from this study demonstrate that managing structural diversity requires boundary management skills among participants of DNoPs. Lessons learned from this study may have implications for other multinational companies that try to facilitate knowledge sharing networks in their KM strategy. Management should acknowledge structurally diverse networks as valuable resources for utilizing the knowledge potential of the organization. A KM initiative that focuses on the development of boundary management skills may be important to utilize the creative potential embedded in structurally diverse networks.

Acknowledgement

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