Exploring Knowledge Work Practices and Evolution in Distributed Networks of Practice

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Abstract. This paper derives from a longitudinal study conducted in a multinational company. Through an interpretive case study approach, we have explored the phenomenon of knowledge networking in distributed work. More specifically, we have focused on the evolution patterns in a particular knowledge networking structure denoted as distributed networks of practice. The paper conceptualizes this kind of network of practice as an information and communication technology (ICT) facilitated dynamic relationship of participants that are geographically and temporally dispersed from one another, and who are sharing and creating knowledge related to their daily work practices and business problems. Three different categories of networks were identified 1) problem solving networks, 2) business improvement networks, and 3) innovation networks. Findings demonstrate that the networks evolved differently over time, and the study identified four distinct evolution patterns comprising 1) devolution in terms of short life cycle and dissolution, 2) recursive patterns where new ad-hoc networks emerged from the mother network, 3) integration of knowledge practices through cross-network proposals, and 4) innovation and expansion in scope and size. While previous studies have suggested fixed models for how a life cycle of a community takes place, this study however identified four dissimilar evolution patterns. Thus, these findings challenge life cycles models suggested in traditional community of practice research. The paper utilizes an information infrastructure perspective to provide an improved understanding of the evolution patterns within these networks by viewing them as ecological social structures facilitated by a technological infrastructure. Through social lines of practice and effective knowledge sharing, the participants created an infrastructure of knowing within the organization and managed to alter organizational practices through evolution. The paper illustrates how a knowledge networking structure as such may facilitate distributed work practices and knowledge activities across temporal and spatial boundaries.

Keywords: distributed network of practice, knowledge activities, evolution patterns, knowledge networking infrastructure

1. Introduction

Researchers and practitioners alike have suggested that communities of practice (CoPs) and networks of practice (NoPs) are significant for knowledge sharing, knowledge creation, learning and innovation within organizations (Brown and Duguid 2001). The concept of NoPs (Teigland 2003) and the sub-set of CoPs (Lave and Wenger 1991) describe self-organizing groups that emerge naturally consisting of individuals conducting practice-related tasks. The main focus in this paper is on *distributed networks of practice* (DNoP), a network structure which represents an extension of the concept of a community of practice (Brown and Duguid 1991; Lave and Wenger 1991). A CoP 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 comparison, a DNoP comprises a larger, geographically dispersed group of participants engaged in a shared practice or common topic of interest (Brown and Duguid 2001; Teigland 2003; Wasko and Faraj 2005). CoPs and DNoPs share the characteristics of being emergent and self-organizing, and the participants create communication linkages inside and between organizations that provide an "invisible" net existing *beside* the formal organizational hierarchy. Within an organization, networks of practice typically consist of weaker ties linking geographically dispersed individuals across an organization that are working on similar tasks using a similar base of knowledge (Granovetter 1973). In distributed work, participants belonging to these networks share knowledge by using different kinds of information and communication technology (ICT) such as email, videoconferences, intranet and other collaboration tools. The dynamics of communities and networks of practice are in former literature conceptualized as life cycles from birth to death (Allee 2003; Wenger 1998; Wenger et al. 2002) or as stages in an evolution model describing development from low to high maturity (Gongla and Rizzuto 2001). The balance between self-organizing groups and degree of formalization with communities of practice has been important to understand since organizational initiatives and management styles may influence upon communities' lifecycles and outcomes (Magnusson 2004; Thompson 2005). In particular innovative communities have showed to be vulnerable for interference and changes, which are not self-initiated and may disturb the virtuous circle and existence of a community (Thompson 2005).

Therefore, organizations that want to utilize these groups need to cultivate them so they sustain and grow. In addition, it is important to understand how these groups develop over time and how to support them. There are, however, few empirical studies, which have focused on different evolution patterns in DNoPs. To explore this phenomenon, a case study was conducted in a multinational company. The following research question was guiding this study: *how do distributed networks of practice evolve over time?*

The longitudinal character of the study made it possible to trace evolution patterns of different DNoPs. The findings in this paper concern four networks and their dissimilar evolution patterns.

The paper is organized as follows. Chapter two presents traditional life cycle models of CoPs. Chapter three presents the research site, methods and findings from this study. Finally, chapter four provides a discussion of the results and the implications of this research.

2. Traditional life cycle models of CoPs

Table 1: Traditional life cycle models of CoPs

Author(s)	Wenger 1998				
Stages of development	Potential	Coalescing	Active	Dispersed	Memorable
Definition	People face similar situations without the benefit of a shared practice	Members come together and recognize their potential	Members engage in developing a practice	Members no longer engage very intensely, but the community is still alive as a force and center of knowledge	The community is no longer central, but people still remember it as a significant part of their identities
Fundamental functions	Finding each other, discovering commonalities	Exploring connectedness, defining joint enterprise, negotiating community	Engaging in joint activities, creating artifacts, adapting to changing circumstances, renewing interest, commitment, and relationships	Staying in touch, communicating, holding reunions, calling for advice	Telling stories, preserving artifacts, collecting memorabilia
Author(s)	Wenger, McDermott & Snyder 2002				
Stages of development	Potential	Coalescing	Maturing	Stewardship	Transformation
Definition	Begins with an extant social network. Informal group of interested people start networking	Community is officially launched, community building has started	From starting to sustaining	To sustain momentum through natural shifts in practice, membership technology and relationship to the organization	Either radical transformation or death
Fundamental functions	Key domain and scope emerge, identifying common knowledge needs, finding people in the organization with same interests, defining common ground	Establish the value of sharing knowledge about the domain, develop relationship and trust, defining value of the community	Clarifying community's focus, role, boundaries in the organization and relationship to other domains, organizing their knowledge	Maintain the relevance of the domain, find a voice in the organization, keep the community on the cutting age	Might loose members, turning into a social club, or splitting into distinct communities, merging with other communities
Author(s)	Allee 2003				
Stages of development	Potential	Coalescing	Maturing	Active	Dispersing
Definition	A loose network of people with similar issues and needs.	People come together and launch a community, finding value.	Takes charge of its practice and grows	Established, goes through cycles of activities	Outlived its usefulness, people move on
Fundamental functions	People need to find each other, discover common ground	Engage in learning activities, designing the community	Members set standards, define learning agenda, joint activities, creating artifacts, develop commitment, relationship	Finding new ways to sustain energy, renew interest, educate novices, get influence	Challenging of letting go, defining a legacy and keep in touch
Author(s)	Gongla & Rizzuto 2001				
Stages of development	Potential	Building	Engaged	Active	Adaptive
Definition	A community is forming	The community defines itself and formalizes its operating principles.	The community executes and improves its processes.	The community demonstrates benefits from knowledge management and the collective work of the community.	The community and its supporting organization(s) are using knowledge for competitive advantage.
Fundamental functions	Connection	Memory and context creation	Access and learning	Collaboration	Innovation and generation

Table 1 describes four life cycle models of CoPs (Allee 2003; Wenger 1998; Wenger et al. 2002), and one evolution model based on experience from IBM's CoPs (Gongla and Rizzuto (2001). The table presents stages of development for each cycle, definition and fundamental functions. Wenger (1998), Wenger et al. (2002), and Allee (2003) have life cycle stages from birth to death and share several similarities. Allee's (2003) last stage, however, is "dispersing", while Wenger et al. (2002) denoted the last stage as "transformation" comprising two alternatives; death or radical transformation of a community. Gongla and Rizzuto (2001) present an evolution model consisting of different stages where the last stage, adaptive, is not the death of the community, but the stage where the community creates competitive advantage in the organization in which it belongs.

3. Distributed Networks of Practice in marine insurance industry

This section presents selected findings from an interpretive, longitudinal case study of distributed networks of practice (DNoPs) in Insure (pseudonym), a multinational company working in the marine insurance industry. The case study focused on analyzing differentiating characteristics of these networks in terms of their knowledge work practices, structural diversity parameters, communication media use, boundary practices and evolution patterns (Hustad 2007). For the purpose of this paper, the focus is directed towards knowledge work practices and evolution patterns in the networks.

3.1 Case overview and research method

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 that provide 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.

Because of the merger*, Insure* needed to go through an organizational change from being a monolithic organization with one business division towards a company consisting of three different business divisions of marine insurance. Dispersed organizational members were required to communicate frequently to ensure integration and transformation of knowledge. The aim was to develop a more holistic understanding of different business concepts of marine insurance across the organization. Therefore, the management did encourage a networking culture by connecting experts through both media-supported professional events and social face-to-face meetings. In situations where urgent topics needed attention from specialists, some managers occasionally 'pushed' the establishment of ad-hoc distributed networks.

Data collection comprised open-ended interviews, field observations and document analysis in five locations of the multinational. The process of data collection and analysis proceeded iteratively, allowing themes to emerge for categorizing, and then to be examined more deeply as relevant.

3.2 Identification of Distributed Networks of Practice

The study identified several networks spun around the organization. These networks interweave and interact with each other across various boundaries, independent of the organization's hierarchical structure. Several of the networks of practice identified were geographically dispersed in which participants were located at different geographical business offices, and thus they were dependent on ICT to sustain a relationship. While some of the networks have a stable composition of members over time, others are more ad-hoc and fluid regarding topics, purpose and membership. Typcially, each of these networks constituted an inter-community structure consisting of multiple co-located communities where participants belong to a co-located community as well as the distributed network. Thus, knowledge sharing occurred between dispersed participants crossing different practices and geographical locations as well as between participants in small co-located communities.

Findings from this case study demonstrate different characteristics of the DNoPs identified and made it possible to divide the networks into three main categories 1) problem solving networks; 2) business improvement networks; and 3) innovation networks (table 2).

Table 2: Classification of DNoPs

Network of practice	Category of network	Outcome
Contract consultancy network	Problem solving networks	Learning
Underwriting networks Claims handling network	Business improvement networks	Incremental innovation
Product development network	Innovation networks	Incremental / radical innovation

3.3 Evolution patterns in Distributed Networks of Practice

For the purpose of this paper, a selection of four DNoPs and their evolution patterns are discussed. The aim is demonstrate how these networks evolved over time by studying these networks' knowledge sharing and creation activities. The findings illustrate different evolution patterns across the networks.

3.3.1 Problem solving network

The problem-solving network is a distributed network of practice which meets the criteria of an expert group. The network provides resources in terms of help-desk functions where participants of the network support other colleagues by giving them special advices as regards particular business problems. In addition, participating in this kind of network ensures collaborative learning among the participants of the network.

The contract consultancy network qualifies as a problem-solving network. The contract consultancy network in Insure was "closed" and had constant membership composition (eleven participants) during their life cycle.

Lawyers from two different locations (Norway and England) in *Insure*, created an initiative for solving complex contract questions in a collaborative manner. A complete informal structure of the network had existed for some time, in which a few people discussed and solved these questions ad hoc through face-to-face interactions. This work became time-consuming and overwhelming, and the lawyers wanted to distribute these problems among additional experts to get a broader discussion to increase learning outcome. In addition, they wanted to get some relief from these kinds of assignments by involving other participants. The intranet announced the establishment of this network as a helpdesk to support the underwriters and claim handlers across the organization. Accordingly, the purpose of the network was to act as a resource group for difficult contracts.

Despite a distribution of the problem and solution thereof, the primary responsibility for contract review and final response to the customer should still lie with the responsible claims handler or underwriter. Normally, the person receiving the request from the customer was responsible for assessment of the contract and replying to the customer. However, if the contract contained special or difficult terms or otherwise merited a closer look, then the person responsible for the review and reply to the customer could refer the contract to the contract consultancy network. To make a referral, the claims handler or underwriter should first make a preliminary assessment of the contract, highlighting the problem areas where they would like input from the consulting network. The objective of the network was to reply within forty-eight hours, depending upon the complexity of the contract.
The participants in this network were mainly lawyers specialized in different fields of maritime law. Two of the participants had the role as editors. The main responsibility of the editors was saving relevant contracts, email discussions and comments from the participants of the group, and the solution and reply to the customer. These documents were stored in the company's document management system (DMS), and indexed as knowledge management documents (KMD).

The network contributed to the organization by building expertise through the experiences from different problem solving processes. For instance, the network contributed to strengthen the competence in marine law and ensured a learning outcome in the organization during its lifetime.

Devolution of the network

The contract-consultancy network was self-organizing with no permanent coordinator. The network had a relatively short life cycle, and at the end of this study, the network was completely inactive. The participants went back to old routines where two persons discussed contracts directly in face-to-face meetings. Occasionally, a third person became involved if the problem was of controversial nature.

According to the informants, there were several reasons why this network did not sustain. Some of the participants pointed to an overwhelming amount of complex and time-consuming questions, which became too difficult to tackle due to the resources dedicated. The easiest way for a busy underwriter or claims handler was to distribute a contract question to the established expert group without doing an evaluation of the problem. In addition, it was difficult to get participants to contribute and take responsibility, and only a few participants contributed effectively in each discussion. The lack of coordination was a weakness, and the discussion became problematic to organize since it was unclear who was in charge of the conclusions. Consequently, the responsibility was "pulverized" as none of the participants closed the open discussions. The use of email amplified this effect since it was easier for the participants to remain silent in an email discussion compared to face-to-face meetings or synchronous videoconferences.

The contract consultancy network dissolved during the study after approximately two years of existence. In sum, ad-hoc coordination, time pressure, and poor contributions from some of the participants in the email discussions, are conceivable reasons why the network did not sustain. According to some of the informants, the outcome of this type of community would be more fruitful if activities had become more structured and coordinated.

3.3.2 Business improvement networks

The networks belonging to this category intend to develop, alter or liquidate practices. More precisely, these networks seek to develop 'best practices' by sharing knowledge related to daily work activities. For the purpose of this paper, two networks within this category are discussed. These are the claims handling and underwriting networks.

The claims handling network is both geographically dispersed and cross-functional with members from all three business divisions. One long-term objective is to create improvements of business processes and policies of marine insurance by exchanging legal experiences and knowledge expertise through frequent interactions. Before the company merger in 2000, the network consisted of members from the P&I division only, but claims handlers belonging to the Marine and Energy divisions became members of this network soon after the merger. The formation of the joint claims network included participants from various organizational cultures and business practices. The claims handlers acknowledged collaborating with new colleagues through networking. By participating in the claims handling network, they learned to manage the integration of claims handling processes across business divisions. In addition, the knowledge networking activities increased the feeling of inclusiveness and membership of the same organization.

After the merger, the network consists of approximately fourteen active participants situated at seven different locations; three in Norway and one each in Finland, Sweden, England, and Hong Kong. In addition, peripheral members participate on the email list of the network. The network has a permanent coordinator who organizes weekly telephone conferences for core members. During these meetings, the participants discuss and share knowledge regarding complex marine insurance claims and report from new and pending claims. One participant makes notes based upon the discussion in the telephone conference, and those notes became part of an electronic available 'meeting minutes book' accessible from the intranet of the company.

Twice a year, the members of this network meet at common gatherings to discuss challenges of developing an effective joint claims handling process in complicated cases of shipwrecks, which involve all business divisions. In addition, the organization wants to avoid development of local routines and rules for claims handling, and the business strategy aims at standardizing claims handling within and across different functions of the entire organization. Furthermore, the objective of these meetings is to make the claims handlers aware of local competencies of their colleagues situated elsewhere in the organization, and thereby establish contact points across the organization.

To meet this objective, participants from different geographical offices provide presentations at these meetings. Through these presentations, participants provide an overview to the whole network as regards local competencies existing at his or her sites of the company. In particular, these meetings are important for members located at the branch offices as some of them have limited access to common information resources such as the intranet. This is because of inefficient line capacity that makes electronic networking difficult.

Evolution and emergence of new sub-networks

The claims handling network was stable over time. The participants had regular meetings and the composition of the main network remained unchanged during the study. However, several new ad-hoc expert networks emerged from the claims handling network consisting of different specialists such as legal advisors, engineers and mariners who participated in pro-active discussions related to potential new insurance risks (e.g. terror threats, bird flu prevention, natural disasters).

The emergence of ad-hoc communities or networks from the claims handling network has a recursive character since it illustrates a process of repeating objects that appear in self-similar ways. In mathematics and computer science recursion is a method to explain a program that directly or indirectly makes a call to itself (Weiss 1998). Thus, the claims handling network represents the root node, which is the initial parameter. The new ad-hoc networks of communities represent child nodes of the root (figure 1). Complex problems that occur in the claims handling networks are better solved by dividing the problem into sub-problems where specialists belonging to a certain knowledge domain create new subsets of networks of practice.
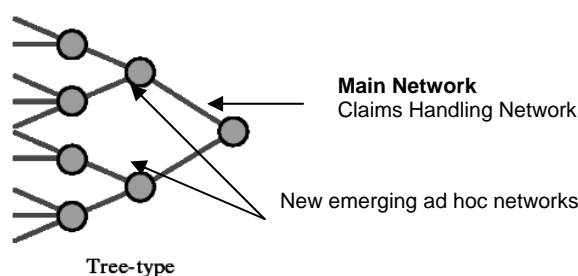
Figure 1: Tree-type network: emergence of new networks from claims handling through recursion

Participants from emergent networks of practice conclude on the original problem from the solutions to the sub-problems.

Although the claims handling network demonstrated stability, the recursive character of the network explains an evolutional feature where the participants in these ad-hoc networks concentrated on being proactive and protective with respect to potential insurance risks.

Leadership style and coordination of communities and networks are important to achieve sustainable networks and evolution (Wenger et. al 2002).The coordinator of this network planned and facilitated events by connecting links between members across boundaries of different organizational units. Findings indicate that the coordinator managed to develop trust and a strong network identity in this group by including new participants from the other divisions just after the merger. The focus on identity and trust building are central research issues represented in both community and team literature as important conditions for effective knowledge sharing and collaboration (McDermott 1999).

The community of practice literature recommends an active leadership in the initial phase of the establishment of a network. As the network becomes established, the leading of the network may be downplayed (Wenger et al. 2002). The coordinator of this network had a supportive role rather than of a controlling style. The network had established routines such as frequent weekly meetings, and formalized procedures for reporting and electronic recording. In addition, the coordinator "pushed" the participants to contribute in meetings. The coordinator was respected among the members. Furthermore, the coordinator acknowledged contributions from the participants. When the network

needed specific competencies, the selection of new members followed the reciprocal principle existing inside a CoP.

Insure has three different *Underwriting Networks of Practice* representing each of the business divisions. The P&I and Marine underwriters have distributed activities, while the Energy underwriters are co-located. The core groups of the P&I and Marine networks share knowledge during frequent videoconference meetings where members from different locations participate. The underwriters have no established routines for creating meeting minutes and KMD connected to their distributed meetings, thus there was no explicit and accessible history of events available from the intranet. However, all three networks have email lists for distributing information to their own group.

The activities in these networks relate to the participants' daily work practices, and the main purpose of the networks is to share common interests regarding underwriting issues and global market trends by exchanging market information and individual experiences related to strategies for "taking control of the market". The underwriting networks consist mainly of senior and junior underwriters, and as such represent homogenous networks with respect to business functions. However, the underwriters belong to different knowledge disciplines that represent a variety of professional backgrounds such as navy, financial expertise, and law. In addition, they contribute with different experiences and competencies from the field of underwriting.

The members of the different underwriting networks meet directly in common gatherings twice a year. One important goal of these meetings is to increase the basic competence about each other's underwriting areas. This is essential when the underwriters meet customers who have or want to buy insurance products from various business functions. It is required that a marine or energy underwriter must know basic elements and principles about P&I insurances and vice versa. However, the intention is not that they should be an expert in all these fields. During the meetings, underwriters from the different underwriting networks give PowerPoint presentations of their work practice, strategies and the underwriting criteria in the market. These documents, indexed as KMD and recorded in the DMS, are accessible in the company's intranet.

The market is divided into different geographical areas, and the underwriters from different divisions who share the same market interests, discuss strategies and potential joint targets in the market.

Evolution through cross-network proposals

These networks changed incrementally over time. Through different joint underwriting initiatives, a new network emerged consisting of members from all the business divisions (see Hustad 2007 for details). These initiatives consisted of joint underwriting activities in terms of meeting face-to-face at common gatherings, establishing cross-functional teams responsible for customers in particular geographical areas, and organizing joint underwriting traveling activities for visiting customers of common interests.

An important goal in *Insure* has been to utilize opportunities for cross sales across business divisions to achieve synergy effects from the organizational merger. In some occasions, a combination of P&I, marine and energy insurances might be of interest for certain customer groups. However, this goal has been challenging to reach, and has in fact been a process taking place over several years. One challenge has been to build competence regarding the coordination of activities across business functions, which could lead to synergy effects. Joint underwriting activities have increased this competence through knowledge sharing and collaboration across practices.

The different underwriting networks went through an evolution that resulted in the emergence of a new larger network of joint underwriting. The evolution involved different boundary spanning activities that took place during joint underwriting events. The emergence of a joint underwriting network corresponds to a process of "perspective taking" (Boland and Tenkasi 1995). During videoconferences, each of the functional underwriting networks are involved in "perspective making" activities, whereby the network develops and strengthens its own knowledge domain and practices (e.g. through unwritten artifacts and narratives). As a perspective strengthens, it becomes more complex and the networks' knowledge activities improve. The emergence of joint underwriting is then a process of "perspective taking", where different functional networks meet and communicate by taking into consideration the unique world of each other's network. In order to integrate knowledge

through perspective taking, communication systems must first support diversity of knowledge through the differentiation provided by perspective making within networks of practice. The evolution of separate underwriting activities into joint underwriting practices also corresponds to process improvements or incremental innovation (Dewar and Dutton 1986). Joint underwriting activities have altered organizational practices by providing increased integration across practices in different divisions.

3.3.3 Innovation Networks

Innovation communities are described as communities that intend to foster unexpected ideas and innovations by combining different perspectives across boundaries (Wenger et al. 2002). Networks within this category enact in innovative processes that cause radical changes in organizational practices or building of new capabilities through for instance product and process development. These networks do often have members from different departments, units or locations of the organization.

The Product Development Network in Insure is an example of a network, which contributes to this category. The main activity in this network is to develop additional insurance covers outside the standardized P&I products. In addition, the network carries out refinements and further development of existing products. The product itself is not a "tangible artifact" but a knowledge-intensive service provided by Insure. This service has an embedded capability of knowledge, which builds upon marine legislation representing the core competence of Insure. The product development network in Insure consists of totally 45 members representing all business units, but most of the members belong to P & I business division. The network is composed of several smaller co-located and geographically distributed sub-networks. Geographically distributed sub-networks have participants from two or four different locations. At the time of this study, the network had developed a product portfolio of ten different products over approximately fifteen years.

After implementation of a product in the market, refinements and updates of the products occur by different sub-networks responsible for these innovations. The network has two coordinators that participate in most of the sub-networks, and the coordinators act as knowledge brokers and create synergies by transferring knowledge across sub-networks. The formation of intersecting sub-networks renders individual activities visible and less secluded across the network as a whole. The coordinators, who belong to the head office, facilitate and organize main activities in the networks and act as catalysts to ensure continuous discussion and interaction between participants.

It is important to note that the network is of a dynamic nature, and the composition of members changes in concurrence with inputs from the market and different competence requirements. Any organizational member may suggest ideas for new products by providing inputs to the product development network. A product idea is normally market initiated by a customer or a group of customers outside the organizational boundary. Different kinds of ICT artifacts enable a communication infrastructure inside the network.

The *product development committee* is an expert group connected to the product development network. In this committee, dispersed participants represent all business divisions including experts, special advisors, managers and others from the operational level of the organization. The members in this committee discuss new ideas and concepts initiated from members participating in the *product development team* and other sub-networks belonging to product development. The product development team is a quite flexible sub-network in which membership composition depends upon the type of product and the multiplicity of expertise required for a particular product development process. While some of the participants represent core members, others are involved for shorter periods. The network transfers new ideas to the committee for approval. The members of the product development team organize all activities to prepare the product and make sure that proper reinsurance structures are possible to arrange with different insurance brokers in the market. In the final phase, the branch office in UK is responsible for the layout of a brochure containing product information to the customers. The product information is accessible from the organization's business portal on the Internet.

Evolution - expanding scope and size

In Insure, local innovation from one co-located community of practice initiated the emergence of the product development network. The network emerged as an informal community of practice with ad hoc face-to-face meetings. The network expanded size and scope over time. In addition, the formalization and acknowledgement of the network increased. Management allocated resources and time to participate. The management wanted to increase both efficiency and effectiveness in the process by formalizing and standardizing both the processes and the outcomes. Two coordinators were formally appointed to facilitate the sub-networks and product development process. In this way, knowledge circulated in the sub-networks and newcomers learned from senior underwriters and claims handlers.

The decision structure moved from the sub-network and development team level to the product development committee. Recently, the management added a new hierarchical level to the network. The top-management needs to discuss new ideas that are quite unusual and controversial to ascertain a defensible investment of the P&I association's funds, which represent the ship owners' capital.

One disadvantage of increasing the formality is that much of the creative spirit will be lost under these structural, formalized circumstances. Participants will decline to bring up new ideas because of the increased hierarchical and bureaucratic path to bringing it forward. That is in contrast to previous practice; a new idea, draft or refinement could be developed and implemented very quickly, even without going through the committee. Another problem with several hierarchical levels is information filtering. Information that passes electronically or directly through different levels may change from one level to the next. Some of the contextual nuances and the tacit knowledge from the knowledge bearer may disappear. An organizational routine in this form may exclude the participant behind the idea who did the basic research regarding the new product proposal. Moreover, filtering could impede a complete understanding of the idea on the decision level and cause non-purposed and incorrect rejection.

One disadvantage is that the creativity may "stabilize" at this level. The network would rather reuse and exploit the knowledge they already have rather than exploring new sources of knowledge to obtain radical innovation through development of new products (March 1991).

4. Discussion and implications

In this study, different DNoPs have manifested themselves as a *knowledge networking infrastructure* facilitating knowledge sharing and creation activities across temporal and spatial boundaries. DNoPs in this study extended or merged with other networks. The overlapping structure of DNoPs represents a larger knowledge networking infrastructure consisting of several networks of practice that interacted across each others' boundaries. Knowledge networking infrastructures have similarities with ecological social structures (Star 1999), and distributed, heterogeneous, socio-technical networks (Monteiro 2000) that provide resources for the organization.

A knowledge networking infrastructure consists of geographically dispersed participants who share knowledge related to their work practices facilitated by a technological infrastructure. Through social lines of practice and effective knowledge sharing, the participants may create an infrastructure of knowing within the organization.

The knowledge networking infrastructure in *Insure* showed evolutionary characteristics that triggered changes in organizational practices. Findings demonstrate different evolution patterns across the networks, and three of the networks went through evolution patterns that resulted in infrastructures that were more diverse and complex than before. In fact, this longitudinal study has identified four different evolution patterns comprising 1) devolution in terms of short life cycle and dispersion (contract consultancy network), 2) recursive patterns in which ad hoc networks emerged from the other network (claims handling network), 3) integration of knowledge practices through cross-network proposals (underwriting networks), and 4) innovation and expansion in scope and size (product development network). Findings indicate that three of the networks were involved in creative evolutionary patterns of change, however, in different ways. Thus, the patterns identified in this study demonstrate differentiated characteristics of DNoPs making it intricate to generalize to one appropriate life cycle model (Wenger et al. 2002). A development model may provide some direction, however, these stages and their sequence can have wide variations in the ways communities experience them (ibid). In this study, the social context of DNoPs influenced and altered

organizational routines. Through networking, the organization became a more integrated organization as participants in different DNoPs shared knowledge across locations and business divisions. Frequently knowledge sharing resulted in outcome of innovation (e.g. product development network) and new practices and routines (e.g. cross network proposals in the underwriting network). In the management literature, scholars have focused on how to enable a climate for these groups by exploiting them more effectively (Swan et al. 2002; Ward 2000). By cultivating their activities to obtain sustainability, they assume that CoPs may stimulate innovation and organizational performance. In the same vein, Brown and Duguid (1998) emphasize the critical role of CoPs in innovative organizations, and that management should utilize these groups more intentionally by constructing and supporting them. The different evolution patterns in *Insure* illustrate the importance of having a strategy, which cultivate the communities to make them sustain and grow. In that respect, the coordinators' role and leadership style were essential to obtain sustainable networks. The leadership style as a facilitator (as opposed to being a controller) encompassed motivating the members to be active participants, ensuring an autonomous environment, acknowledging contributions, building trust and identity and bringing necessary resources into the networks so the members had available time to participate.

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