

**Cracking the core:**  
**How core members of Electronic Networks of Practice contribute to  
organizational learning**

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**ABSTRACT**

This study investigates the role that core members of organizational electronic Networks of Practice (eNOPs) play in supporting organizational learning. Building on insights from literature on organizational learning, offline communities and online networks, our multi-methods case study at an international chemical company reveals that core members of eNOPs perform three roles that contribute to organizational learning: “interpreting” (contributing expertise), “integrating” (of content and connections) and “institutionalizing” (interfacing between network and formal organization). Through these roles, core members not only contribute expertise and organize eNOPs, but also integrate and institutionalize knowledge on both the organizational and the network level. As such, the study shows how core members play a key role in supporting organizational learning through eNOPs.

**Networks of Practice, Organizational learning, Core members, Knowledge sharing,  
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## INTRODUCTION

A central assumption in the literature on online networks is that the functioning of a network largely depends on a group of core members. Core network members are mostly defined in quantitative terms: as the critical mass (Mockus et al., 2002; Wasko et al., 2009), the most active contributors (DeSanctis et al., 2003; Ren et al., 2007) or by core-periphery type network structures (Borgatti and Everett, 2000; Huang and DeSanctis, 2005), without paying attention to who these people are and what they do. Moreover, most literature on core members in online networks focuses on informal networks outside hierarchical contexts. The importance of core members is also emphasized in literature on offline communities, where core members provide intellectual and social leadership by actively contributing their expertise and coordinating the network's activities (Borzillo et al., 2011; Wenger et al., 2002; Wenger and Snyder, 2000). More specifically, core members in offline communities, such as communities of practice are considered to play a key role in supporting learning processes (e.g. Wenger et al., 2002).

So far, the two fields of study have not merged. Consequently, we are still in the dark whether and how the contribution of firm based online networks, also referred to as organizational electronic Networks of Practice (eNOPs), to organizational learning depends on core members. eNOPs are voluntary groups of dispersed people interacting about a shared practice (Agterberg et al., 2010; Vaast and Walsham, 2009) that exist primarily through computer-mediated communication (Wasko and Faraj 2005: 37). As organizations increasingly try to stimulate online networks to support organizational learning (e.g. Agterberg et al., 2010; Pan and Leidner, 2003; Kane and Alavi, 2007), it is interesting to understand in more detail what constitutes a core group of an eNOP and in particular what these core group members do to contribute to learning.

Considering the lack of (empirical) studies, we conducted a multi-methods case study to answer the following research questions: 1) *who* are the core members of an organizational eNOP 2) *what* do these core members do and 3) *how* do these core members support organizational learning? We conducted this case study among four eNOP's of an international chemical company who were actively involved in sharing their distributed knowledge.

The remainder of this paper is organized as follows: After further theoretically elaborating on who core members are, what they do and how they may support organizational learning, we will explain our methods and introduce our case study. We will first identify the core members through a survey. To identify core eNOP members, network members were asked to nominate the members they considered significant for the network and to motivate their choices. This enabled us to identify the most important members of the networks instead of merely identifying the most active members. We subsequently identify the activities and learning roles these core members perform through a content analysis of all 3987 messages posted on the networks. Subsequently we draw on interviews and observations to investigate how these roles relate to the processes underlying network and organization level learning. We conclude with a discussion of our findings and recommendations for further research.

## 1.1 Theoretical Background

Although existing theory on core members of networks and communities provides us with useful insights, they provide only few cues as to who these core members are and what they are actually doing. For instance, research on offline communities of practice finds that about 10 to 15% of the members belong to the core group (Wenger et al. 2002, p. 56). These core members are active and knowledgeable participants, and may over time also take on coordinator roles, responsible for structuring the process, organizing meetings and so on. Empirical studies on core members in online networks however, primarily draw a quantitative distinction between the core community members and the ones belonging to the periphery, usually by applying social network analysis methods (e.g. Borgatti and Everett 2000; Whelan 2007). These studies provide insight in the interaction patterns of the network members, showing that core members engage in communication with peripheral members (Huang and DeSanctis 2005; Wasko et al. 2009) instead of being an isolated clique, and thus act as a bridge to the periphery, to trigger discussion and share expertise (Huang and DeSanctis 2005).

While mostly referring to more or less formal leaders, literature on electronic networks outside an organizational context does provide some pointers for the roles that need to be performed to support a network's functioning. Moderators or facilitators who help maintain infrastructure and membership continuity, promote activity and help the network to develop a sense of community (DeSanctis et al., 2003; Jones and Rafaeli, 2000; Ren et al., 2007; Silva et al., 2008) are for example mentioned as important roles to be fulfilled. In addition, a network's functioning depends on the expertise that individual members contribute to the group (Bergquist and Ljungberg, 2001; Fleming and Waguespack, 2007). These roles are however said to support knowledge sharing outside the organizational context. These studies do not say who performs these roles or what they actually entail and also provide little evidence for how these roles support organizational learning within organizational eNOPs.

To explore how core members support organizational learning we will use the 4I framework of Crossan, Lane and White (1999) as our analytical framework because it allows a fine-grained analysis of the learning processes underlying organizational learning (e.g. Crossan and Berdrow, 2003; Vera and Crossan, 2004). The framework depicts organizational learning as a multi-level process, occurring at the level of the individual, the group and the organization. Learning at each level influences learning at the other levels and is connected through feed-forward and feed-backward knowledge flows. Because we are interested in the roles and activities in eNOPs that contribute to organizational learning, we will restrict our analysis to the group (i.e. the eNOP) and organization level learning, and disregard individual level learning. Group level learning involves the sharing of individual interpretations to develop a shared understanding. Organization level learning represents the translation of shared understanding into new products, systems, structure, strategy, procedures, or culture (Bontis, Crossan and Hulland, 2002; Crossan et al., 1999). According to the framework of Crossan et al. (1999), four learning processes underlie the process of organizational learning: intuiting, interpreting, integrating and institutionalizing, resulting in the so-called "4i's framework". As mentioned, since individual learning is outside the focus of this study, we exclude the process of *intuiting* from further analysis.

*Interpreting* refers to “the explaining, through words and/or actions, of an insight, or idea to one’s self and to others’ (Crossan et al. 1999: 525) and occurs at both individual and group levels. Interpreting encompasses social interaction within a wider network (Dutta and Crossan, 2005) and can be enhanced when one has domain relevant expertise, control of scarce resources and culturally appropriate social skills (Lawrence, Mauws, Dyke and Kleysen, 2005). *Integrating* is ‘the process of developing shared understanding amongst individuals and the taking of coordinated action through mutual adjustment’ (Crossan et al., 1999: 525). This process occurs at the group level and may take shape through conversation and shared practice among community members. Integrating is affected by effectively working in groups, having the right people in the group, being prepared to share success and failures, conflict resolution and so on (Lawrence et al., 2005). *The institutionalizing process* has been described as ‘ensuring that routinized actions occur’ (Crossan et al., 1999: 525). Institutionalization is ‘the process of embedding learning that has occurred by individual and groups into institutions of the organization and it includes systems, structures, procedures and strategy’ (1999: 525). Institutionalization thus occurs at the organization level and requires that ‘tasks are defined, actions specified and organizational mechanisms are put in place to ensure that certain actions occur’ (1999: 525).

## **1. METHOD**

To investigate what significant eNOP members do to support organizational learning, we conducted a case study at an international chemical company. An interpretive case study can provide a rich and detailed understanding of a rather new phenomenon, in this case of how core members of eNOPs support organizational learning. A more detailed explanation of these methods follows after the case description.

### **2.1 Case Description**

‘The Chemical Company’ (TCC) produces polypropylene and polyolefin products for which a diverse range of technologies and production processes are developed within the organization. With plants throughout the world, manufacturing activities in 20 countries and sales activities in more than 120 countries, the expertise of TCC’s 6700 employees is highly distributed. Because of this dispersion and the highly knowledge intensive character of the chemical industry, TCC’s management decided to facilitate 17 online knowledge networks to support knowledge sharing throughout the organization. TCC’s knowledge networks, called “KX networks” are organized around specific areas of expertise like Polypropylene, HSE (Health, Safety and Environment) and Maintenance. The networks are e-mail based discussion forums where people can post their messages, reply to messages, create links to external sources, send in and store documents and create polls. A global “knowledge exchange” team was composed and made responsible for facilitating the networks. After a discussion forum was implemented, the global knowledge exchange team invited people to become members of the networks relevant to their daily work. The individual employee decided whether to participate or not and membership remained voluntary. To gain membership an online request has to be filled out which is to be

approved by the network's management, which in practice was always granted provided that one's daily work was related to the network's topic. On average, the networks had 155 members, who posted a total average of 500 single messages per year.

Apart from the colleagues met during their daily work, network members did not meet face-to-face. Every network had about two moderators, generally high-level managers in the field. Moderators were supposed to stimulate discussion in the network, organize the network, and transfer relevant knowledge between the different networks. Moderating a network was an additional task for these managers for which they did not receive additional time. In practice, these roles were performed by other members as well.

Most postings on the networks related to problems faced at site for which advice from the other members was sought. In addition, a number of messages informed the network members on local issues, aiming to help them prevent issues or improve local work processes. The main perceived benefits of the networks were extending social networks in the organization, quicker or better problem solving, and improving organizational processes.

To gain more in-depth understanding of the networks, it was decided to limit the scope of our research to four networks considered representative for TCC's networks: Maintenance, Health, Safety & Environment (HSE), Supply Chain (SC) and Quality Management (QM). We were involved with TCC's knowledge networks from 2005 until 2010. During this period we conducted interviews (N=24) and a survey, we made site visits, observed at (teleconference) meetings, moderator conferences and gained access to the four networks and their log files as well as to organizational documents related to the knowledge networks. Our key-informant, the global knowledge exchange manager, gave us regular updates throughout the years of our studies. Log file data were obtained from the network's start in either 2001 or 2002 till May 2006.

## **1.2. Data Collection**

**2.2.1. Survey.** To identify core network members we aligned with a commonly accepted procedure used in social network analysis (Straits, 2000) in which core network members are defined in terms of the most significant people in someone's network. We administered a survey in which people could nominate the persons they considered most significant for the network of which they were a member. A message with a link to the survey was posted on each network. Members could nominate up to three people and were not allowed to nominate themselves. A list with names of all members was provided to help recall names. Notwithstanding the response rate (N= 176; 34,5% ) we deemed these results to suffice since we do not use survey results for causal reasoning. Respondents were representative in terms of their organizational level and geographical location. In addition, to help understand why these people are considered significant, we asked people to motivate their choices by asking them why they considered these persons most significant for the network.

**2.2.2. Content Analysis.** Because of its reliance on online communication, analyzing the communication content of the network is an appropriate method for investigating the

activities that core members perform. Our sample includes all messages (N=3987) posted in the four networks from May 2004 up to the time we actively started our investigations at TCC in May 2006. Each single posting served as unit of analysis. Classification in multiple categories was allowed but only if single classification would exclude another significant core member activity (see table 1 for operational definitions). Categories were inferred from the content of the messages in an inductive process. When no new codes emerged, results were discussed amongst authors. This explorative process resulted in nine different core member activities. Table 1 shows the nine categories, their final operational definitions and the reliability of each category.

**Table 1: Coding Scheme of Core Member Activities**

<b>Categories and operational definitions</b>	<b>Category reliability</b>
<p><i>Ask questions</i> Asking for help, advice or information or the experiences of other members; generally related to an issue faced by author in local situation. <i>Not:</i> request to do a task or give instructions on how input is expected to be given. Never in combination with the code ‘tell others what to do.’</p>	93%
<p><i>Answer questions</i> Responding to questions posed on the network; sharing expertise;</p>	95%
<p><i>Provide unsolicited information</i> Sharing information, stories or links that are considered to be of possible interest to the other members without the aim of answering questions or introducing a question. Never in combination with ‘ask questions’ or ‘answering questions’.</p>	80%
<p><i>Further discussion</i> Asking for more information or clarification, pointing out other relevant issues in discussion. Providing additional insights from local experience. Never the first message of a discussion thread</p>	84%
<p><i>Evaluate and capture contributions</i> Drawing conclusions from discussions; capturing the input of members; evaluating(the value of) contributions; formulating lessons learned and best practices; giving feedback on contributions; designating article of the month. <i>Not:</i> summarizing your own posting; <i>Not</i> summarizing ‘offline’ learning or learning from local experience.</p>	86%
<p><i>Broker to other people or resources</i> Referring to other people or resources located inside/outside the KX network; providing details of other people or places e.g. where to find help with a problem.</p>	83%

<i>Brokering between network and formal organization.</i>	88%
Taking information from the network to the formal organization or vice versa; messages about formal decisions or team meetings; taking discussion topics from the network to a formal management meeting. Issuing new global guidelines. Speaking on behalf of corporate TCC.	
<i>Moderate network.</i>	95%
Postings related to the organization and structure of the network; setting norms on how to behave in the network; showing appreciation e.g by granting rewards; compiling a who-is-who list; communicating about the functioning of the network; making folders to structure discussion; call attention for unanswered questions; explain where to find something on the network	
<i>Tell others what to do</i>	80%
Directly asking someone/the network to do something specific. For example: ask for specific input by a manager for a formal meeting; direct decision taking about how work has to be done in the future. Detailed formulation of what one wants from the other members (as opposed to the code 'ask questions'). Top-down manner.	

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Core member activities cannot be directly measured as they may be represented or measured by several indicators. We thus needed to interpret the underlying meaning of the text, requiring manual content analysis. An initial description of each category was developed and a research assistant, not aware of the research aim, was appointed as second coder. After the first author and the second coder independently coded a subsample of messages, they discussed their results and made adjustments to the operational definitions of the categories. It took three iterations of coding, discussion and adjustment to the decision rules to achieve and maintain a final intercoder agreement score of 89%, which is above the generally accepted norm of 80% (Kassarjian, 1977; Lombard et al. 2002). In addition, category reliability scores were calculated (see table 1). To assure stability reliability (Kasserjian, 1977), intra-coder agreement scores were calculated resulting in a reliability score of 90% for the first coder and 97% for the second coder.

**2.2.3. Interviews.** Twenty-four in-depth semi-structured interviews were held with a wide variety of people: six members from senior level management (site manager or higher), 13 members from middle management level or lower, four moderators and one non-member. Interviews lasted between 45-60 minutes and were mostly conducted face-to-face, although seven interviews were conducted by telephone due to geographical distance. Interviews were recorded and verbally transcribed. In three cases we carefully made notes during and immediately after the interview because recording was not possible. Topics included: the use and value of KX networks in daily work, the organization and social make-up of the network, core members and their activities and the three learning processes. The interviews were analyzed in two phases. First we identified the activities of core members. With the activities resulting from the content analysis as our sensitizing concepts, we started coding the activities of core members. This analysis of the interviews revealed similar activities as

observed in our content analysis (see table 1). The second phase of the interview data analysis was to explore how these activities relate to the three learning processes by taking interpreting, integrating and institutionalizing processes as constructs for the coding process and then progressed with searching for patterns between the activities and the learning processes (Eisenhardt and Graebner, 2007).

### **3. RESULTS**

#### **3.1. Who are Core Members?**

The results of our voting procedure showed that 67 out of 501 members were perceived as significant and accordingly will be labeled as core members. From the 67 members perceived as significant for the networks, 12 were deleted from further analysis because they were not active within the networks themselves. On average, core members receive 7.1% (SD=7.4%) of the votes. Respondents nominated 1.48 people on average (SD= 0.69)..

On average, 14 core members were nominated for each network; 10.6% of all members. 11 core members are (or have been) moderator of one of the four communities, eight core members are top-level managers, 33 are mid-level managers, one core member is Knowledge Exchange manager and the remaining core members are lower-level managers or non-management. These numbers indicate that besides the moderators, who were all nominated at least once, a great number of other members are considered as valuable to the network as well. Hence we will focus our further analysis on the activities that these core members enact.

Coding and categorizing the motivations respondents gave for their choices resulted in four main motivations for perceiving someone as significant for the eNOP. First, being an expert and therefore able to make useful contributions is by far the most frequently mentioned (111 times) reason for nominating someone as significant. Being an active participant, willing to share knowledge and help others, is mentioned 49 times as a reason for core membership nomination. Thirdly, an organizational role surfaced 42 times from the analysis, referring to persons with a high formal position, and/or an organization level scope who aim to institutionalize outcomes of the network to improve the organization. Fourthly, members were nominated 39 times for their facilitating activities; being a moderator and/or helping to build and promote the community, for example by intervening in and summarizing discussions, are reasons for perceiving someone as significant.

#### **3.2. What Core Members Do**

Content analysis of the messages revealed that by far, answering questions was the most frequently enacted activity by core members, followed by furthering discussion, broadcasting unsolicited information and asking questions. An overview of the occurrence of these activities in the messages of core members of the four networks is represented in

table 2. The four networks did not differ significantly ( $p > .05$ ) in the extent to which the activities were performed.

**TABLE 2**  
**Occurrence of activities enacted by core members in eNOPs**

	<b>Maintenance</b>	<b>HSE</b>	<b>Supply Chain</b>	<b>Quality Management</b>	<b>Total</b>
Ask questions	42 (11.5%)	19 (4.2%)	30 (11%)	33 (8.6%)	124 (8.4%)
Answer questions	154 (42.2%)	160 (35.5%)	120 (44.1%)	157 (40.9%)	591 (40.2%)
Provide unsolicited information	31 (8.5%)	115 (25.5%)	32 (11.8%)	48 (12.5%)	226 (15.4%)
Further discussion	33 (9%)	61 (13.5%)	42 (15.4%)	65 (16.9%)	201 (13.7%)
Evaluate and capture contributions	36 (9.9%)	30 (6.7%)	1 (0.4%)	12 (3.1%)	83 (5.6%)
Broker to other people or resources	24 (6.6%)	35 (7.8%)	12 (4.4%)	21 (5.5%)	92 (4.2%)
Broker between network and formal organization.	6 (1.6%)	15 (3.3%)	21 (7.7%)	24 (6.3%)	66 (4.5%)
Moderate network.	31 (8.5%)	2 (0.4%)	7 (2.6%)	13 (3.4%)	53 (3.6%)
Tell others what to do	8 (2.2%)	14 (3.1%)	3 (1.1%)	11 (2.9%)	36 (2.5%)
<b>Total</b>	<b>365</b>	<b>451</b>	<b>272</b>	<b>384</b>	<b>1472</b>

To investigate whether and how these acts relate to a specific role, the total number of times each act was performed by each core member was calculated. These figures were subsequently subjected to explorative factor analysis (Principal Components Analysis with Varimax rotation) to identify whether these members take on distinct roles. Three factors emerged, implying that core members take up three distinct roles. These three roles were labeled according to the three learning processes defined by Crossan et al. (1999), distinguishing an “interpreting role”, an “integrating role” and an “institutionalizing role”. Since the act “providing unsolicited information” cross loaded on both the interpreting role

(.54) and institutionalizing role (.57), this was removed from further analysis, resulting in three roles with factor loadings of .80 or higher, as shown in table 5. Together these three roles explain 79.5% of the variance in the data. The four networks did not differ significantly ( $p > .05$ ) in the extent to which the three roles were performed.

**TABLE 3**  
**Factor Analysis of learning roles.**

	<b>Interpreting</b>	<b>Integrating</b>	<b>Institutionalizing</b>
Further discussion	.90		
Answer questions	.90		
Ask questions	.83		
Broker to other people or resources	.80		
Moderate network		.89	
Evaluate and capture contributions		.83	
Broker between network and formal organization			.87
Tell others what to do			.84
Eigen values	3.77	1.47	1.11
Percentage of total variance	47.24	18.38	13.91

Interpreting is by far the most frequently manifested role ( $M= 18.33$ ;  $SD= 23.01$ ) followed at distance by the role of “integrator” ( $M=2.47$ ;  $SD=4.49$ ) and finally, the role of “institutionalist” ( $M=1.85$ ;  $SD=4.28$ ). The mean score signifies the total number of times a role was enacted by core members in their messages. For example, core members have on average performed the interpreting role 18 times in their messages. The large standard deviations found for each role signify substantial differences in the extent to which they performed the three roles.

### **3.3. How Core Members Support Organizational Learning**

Our results show that each role contributes to one of the three learning processes that Crossan and colleagues (1999) identified in their 4I framework of organizational learning. This implies that core members can be considered key actors in supporting organizational learning through eNOPs. In this section we draw on interview data to provide meaning to this finding.

**3.3.1. Network level learning.** Group (or network) learning is highly present in TCC's knowledge networks. As noted by Dutta and Crossan (2005), network-level learning requires social interaction among network members. An example of network level learning resulted from a discussion started by a Quality Management member on the outside storage of materials. He wondered if other sites stored their materials outside, whether they use specific precautions and if they had ever had any customer complaints. After a vivid discussion among nine members it was finally agreed that:

*“No special packaging material is to be used to store product outside. In general all materials can be stored outside and packaging material should be appropriate to do so. [Name contact person] can help when it comes to specs”.* (Excerpt from message posted by a member)

**Interpreting process.** Even though the interpreting process has been described by Crossan et al. (1999) to start at the individual level, we center our analysis on network levels of interaction as our research focuses on network dynamics. Interpreting starts as fellow network members begin to interact and share insights on the online forum. Through sharing expertise and making contributions, the interpreting process is thus enhanced. Besides frequency of contributions, the quality of the contributions influences the value of the interpreting process: core members tend to have high expertise and a wide social network within the organization. For instance, core members were generally well respected for their ability to ask interesting questions. One frequently mentioned core member described her activities as follows:

*“Then we stimulate discussion. Let's see, my job is to find, wherever, interesting topics. This is of course part of my every day work.(...) I often look at the customer complaints that have been filed, even if there is time delay because normally I look in the last quarter or half a year ago, looking for repetitiveness. And if I find something which is the same problem at different sites, at the same time perhaps, then I add it in. Tell people that a lot of sites are dealing with the problem.”* (interviewee 4, moderator)

In addition, people with a wide organizational perspective are better able to act as knowledge brokers, helping members to get in touch with the right people or referring them to other sources of information.

Clearly, the interpreting process does not depend solely on the core members as every member is able and even expected to join the discussions. However both the content analysis and the interviews indicate that core members share a substantial level of expertise.

**Integrating process.** Discussions from the interpreting process may naturally flow into the integrating process if shared understanding of for example what the problem is or how it can be solved and prevented, results from the knowledge exchanges on the networks. Core members performing the integrating role are often moderator of an eNOP: except for one, all moderators nominated as core member performed at least the integrating role. Integrating activities (partly) resemble a facilitator or moderator role as described in literature (e.g. DeSanctis et al., 2003; Ren et al. 2007).

Core members support the integrating process by evaluating and synthesizing the contributions made by network members. As one member of the steering committee

declared at a moderator conference, synthesizing messages is important to help create a *'pool of relevant knowledge instead of a sea of data.'* Even though this is highly appreciated, the content analysis showed that evaluating and capturing contributions, which falls under the integrating role, is not frequently performed. Core members who do this are however considered helpful. As one respondent explained his nomination for somebody as a core member: *"If the discussion is running nowhere, she dares to summarize the main points and to propose or state a proper convergence."* By integrating the content exchanged on the networks, "integrators" help reaching a shared understanding of, for instance, how a problem should be dealt with. While this was generally considered a role for the moderator, other members perform this role as well, as the following interviewee explains:

*"Initially when we formed the network some years ago, the role of the moderator was to read all of the input, summarize the content and put that summary back on the knowledge network saying: you know there have been this and this exchanges on the network this year, and essentially the greater meaning is this and that. So, now I am making a summary of this year, and will be reaching conclusions."*  
(Interviewee 16, top-level member)

Besides a shared understanding of the practice, integration is also furthered if network members have a shared understanding of themselves as a group. "Integrators" contribute to this by making sure everyone knows how to use the system, how to behave and how to organize themselves. This helps the network to function more effectively which in turns facilitates cooperation and shared understanding. For example, core members who perform the integration role make sure that only people who have the potential to contribute are accepted as members.

Another way to foster a shared understanding regarding the groups is to guard the norms by which the group operates. If for instance misunderstandings on how to behave on KX networks occur, core members intervene and make sure that everyone is aware of and adheres to the group norms. This fosters a cooperative atmosphere which in turn enhances shared understanding and cooperation.

*"And I just put in: 'I think this is a very interesting topic because there are several customer complaints.' Ok. The question was immediately: which plant was it? I said in another e-mail, that is not something to put directly on the KX because then people [don't dare post issues anymore]..., if they just look for a guilty person, that's not my job!"* (Interviewee 4, moderator)

"Integrators" help the network members undertake joint action. For example, conclusions from discussions make it easier for network members to determine what actions could be undertaken in response to the topics discussed. "Integrators" also nominate the most valuable contributions, thereby not only providing norms for what makes a good contribution, but also drawing attention to newly developed ideas that other members might take up. Nominations for best contributions of the quarter and year are announced on the KX network. TCC's magazine sometimes reported 'success stories' of KX, which also happened to the winning article of the maintenance community of 2003. The initiator of the

discussion was a maintenance engineer facing problems with a specific motor type. The magazine's article reads:

*“Frequent breakdowns in the last two years pushed us to review our preventive and predictive maintenance. In order to solve our problem, I used KX to find out what type of maintenance is done at other TCC sites’. His curiosity sparked some three dozen replies from colleagues all over TCC and has to potential to be developed as a ‘best practice.’”* (Excerpt from TCC magazine, third issue 2004).

While “integrators” may thus enhance network level learning by integrating both the connections among members and the content they exchange, whether these new insights feed into organizational level learning largely depends on those supporting the process of institutionalizing.

**3.3.2. Organization level learning** Organization level learning occurs when the (global) organization and its processes, strategy, culture and routines are affected (Crossan et al., 1999). The following passage provides an example of how network level learning ultimately feeds into organization level learning:

*Winning KX question leads to global guidelines. A request to the KX maintenance network for advice on inspecting polymerisation loop reactors has become the network's 2004 ‘Article of the year’ after it resulted in the development of best practice guidelines that are now reducing downtime and costs. (...) John asked the KX maintenance network for recommendations and the 26 replies from around the world showed wide variation in practice. (...) Peter G., Vice President of operations and maintenance, acknowledged the need for a global policy, initiated a risk assessment and led the writing of guidelines. He said: “John is the winning article because it went through the whole cycle from starting the KX discussion through development of a global policy. (Excerpt from TCC Magazine, third Issue 2005).*

**Institutionalizing process.** As the above excerpt shows, organization level learning is fostered by people who broker between the formal organization and the network. In other words, those core members supporting the process of institutionalizing foster knowledge flows between the level of the organization and the network. Core members who contribute to organization level learning all possess mid- or top level management positions, which enables them to identify what learning from the network could be taken to a higher level. In the following quotation a vice president explains how organizational level learning is fostered by higher level managers who challenge members to think from an organizational level perspective.

*“Yeah or to build on findings you know. Let's say the lubrication fails for them [local site]. The site manager might say, well okay you can think that the current solution is great. Is that because you know we have spent our resources and there are no more maintenance people available on site or is there a better solution possible for all sites? So they [the site manager] might build on the findings also at a different level.”* (Interviewee 16, top-level member)

Occupying a higher management level position also enables core members to make organizational level decisions. The vice president mentioned in the above excerpt from the magazine exemplifies this as he was able to initiate a risk assessment and embed network level learning into a new global policy. This new policy was in turn communicated back to the network by the vice president. As such, this person brokered between the network and the formal organization and consequently contributed to organizational learning. Besides taking insights from the network to the organization, those core members who support institutionalizing also stimulate organizational learning by communicating about global developments or formal decisions to the network level. This way the network's exchanges are more aligned with for example corporate strategy which enhances mutual adjustment and shared understanding. As a result, these exchanges more readily feed into organization level learning. Likewise, core members may foster organizational learning by requesting specific information from network members to help investigate and solve organizational level issues. The global Quality Management manager for instance, used polls to collect data on different procedures followed by sites, the results of which were synthesized and discussed on the network (integrating process) and subsequently used for the development of new global quality measures.

Even though institutionalizing activities take up only a small percentage of the exchanged messages, they are important as they give organizational value to the network. As these roles are less frequently enacted, however, most exchanges remain on network levels. This might explain why the interviewees emphasized the importance of institutionalizing as compared to how apparent these roles were in the content analysis.

*“For example we had a near miss, we found some weak points in our system and were looking at our guidelines. We posted an article on KX to ask for guidelines of other sites. The posting got over 100 hits in few days but no one knew a solution. We did get replies like please let us know how it works out because we are encountering the same. So we knew it was not just us overlooking something and that it was a broader problem. So if we now solve it and post it on KX, it should be abstracted to a new official protocol to which one can be referred on the intranet or something. That's what we should do.”* (interviewee 2, top level member)

#### 4. DISCUSSION

Our study showed that, in line with studies on core members of other groups (e.g. Wenger et al. 2002) about 10% of eNOP members are considered to constitute the core of the network because of the high level of expertise they contribute, their efforts to support the functioning of the network or because of their high formal position. These core eNOP members collectively help their eNOPs contribute to organizational learning. In doing so, core members may take up three different roles, each supporting a different learning process. Core members supporting the process of interpreting feed their knowledge into the eNOP, predominantly supporting network level learning. Core members supporting the process of integrating facilitate network level learning by integrating both the connections between the eNOP members and the content they exchange on the network. Core members

contributing to the process of institutionalizing support organization level learning by creating knowledge flows between the level of the network and that of the organization, and embedding network level learning in the organization.

Our findings thus show that members collectively help the eNOP contribute to organizational learning and thereby provide evidence that these processes do not merely depend on formal leaders as previous studies on organizational learning implied (Berson et al. 2006; Vera and Crossan 2004). Rather, like in literature on managing co-located communities of practice (Wenger 2000; Wenger et al. 2002), our study reveals that organizational learning through online NOPs also depends on a group of core members..

Literature on online knowledge networks usually points out the importance of those members making the most contributions (DeSanctis et al., 2003; Mockus et al., 2002; Ren et al., 2007) and those organizing the network (DeSanctis et al., 2003; Jones and Rafaeli, 2000; Ren et al., 2007; Silva et al., 2008). While we have found that core members are indeed actively contributing their expertise and are taking on organizing activities, our findings imply that core members of informal knowledge networks within hierarchical settings fulfill different roles than their counterparts in literature related to online networks in fully informal settings.

First, the importance of core members linking network level learning with organizational level learning has, to our knowledge, not been identified in literature on online knowledge networks before. Like mentioned by previous studies on organizational learning (e.g. Bontis et al., 2002; Lawrence et al., 2005), organizational level learning does not simply result from the knowledge exchanged in eNOPs, but rather ‘depends on interested actors who work to embed them in routines, structures and cultures of the organization’ (Lawrence et al., 2005: 182). Our study shows that without these members supporting institutionalizing the networks’ exchanges are likely to result in what March and Olsen (1975) named ‘audience learning,’ referring to a situation where no organizational level actions result from individual actions. It is also striking to note that active involvement of higher management showed to be important while it usually is considered counterproductive for informal and practice based knowledge sharing to occur (Agterberg et al., 2010; Hayes and Walsham, 2001; Thompson, 2005). Literature suggests that core members who support institutionalizing processes are confronted with a need to balance on the thin line between too much or too little managerial involvements (Brown and Duguid, 2002). In our study, core members supporting the institutionalizing process apparently do not face such a management dilemma. Instead of often observed conflicting interests between the strategic aims of ‘above’ versus the reality of daily life on the work floor (e.g. Agterberg et al., 2010), both management and experts of TCC seem to share the practical interest of keeping the work processes up and running. Further research in other types of organizations might shed more light on the role of core members supporting institutionalizing processes and its effect on knowledge sharing behavior.

Second, while our study supports the role of moderators or ‘integrators’ in connecting network members, we have identified a new set of facilitating activities not discussed in theory on moderators so far (DeSanctis et al., 2003; Jones and Rafaeli, 2000; Ren et al., 2007; Silva et al., 2008): besides integrating *connections* amongst members, moderators or

'integrators' also integrate the *content* of the network (e.g. by summarizing and evaluating contributions). By doing so, core members enhance knowledge integration and thus network level learning. While moderators are considered important for sustaining network activity (DeSanctis et al., 2003; Jones and Rafaeli, 2000; Ren et al., 2007; Silva et al., 2008) their role in supporting organizational learning has not been acknowledged so far.

With regard to "integrators" intervening in the connections between eNOP members we also found an unexpected result. While social dynamics such as trust, shared identities and social capital are widely recognized as key factors for knowledge sharing in online networks (Agterberg et al., 2010; Von Krogh, 1998; Wasko and Faraj, 2005), the networks in our case show a relative lack of socially oriented activities. Very little attention was paid to group identity formation, trust issues, face-to-face meetings or social talk. One explanation for this lack of relationally oriented behavior might be that in organizationally embedded NOPs the organizational context may surpass the importance of strong ties among network members as working for the same organization might overrule for example network level identity formation. The organizational context thus seems to augment the utilitarian type of interactions in these eNOPs (Faraj and Johnson 2010), thereby overruling the importance of strong ties. This finding calls for more research on the role of social behavior in organizationally embedded eNOPs.

Our last contribution is to theory on organizational knowledge sharing groups. Most studies on these groups focused on local situations (e.g. Bechky, 2003; Duiguid, 2005; Wenger and Snyder 2000), on explaining knowledge sharing behavior in NOPs (e.g. Agterberg et al., 2010), on investigating if and how local learning may result from NOPs (e.g. Vaast, 2007; Vaast and Walsham, 2009) or on IT use (e.g. Hayes and Walsham, 2001; Olivera et al., 2008; Vaast, 2007; Vaast and Walsham, 2009) without taking organizational learning or at least organization-level learning into account. Our study shows how these distributed knowledge sharing groups may contribute to organizational learning by detailing the underlying learning processes and unraveling the activities that core members may fulfill to contribute to these processes.

Every study has its limitations and this study is certainly no exception to this rule. Most importantly, we reported on a single case study only, and it is well possible to find other activities, roles and relations between those and organizational learning in other settings. The relative importance of core members supporting institutionalizing processes in TCC's network and the lack of socially oriented activities might for example be augmented by the rather hierarchical organizational culture in TCC, its technical focus, or even by the dominance of males (Soukup, 1999) in TCC and its networks. Given the growing interest among both organizational practitioners as well as scholars in eNOPs for organizational learning purposes, more research on core eNOP members and the activities and learning roles they perform would be highly welcomed.

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