

Cracking the Core: How Core Members of Networks of Practice Contribute to Organizational Learning

Abstract

This study investigates the role that core members of organizational Networks of Practice (NOPs) play in supporting organizational learning. Building on a multi-method case study at an international chemical company, the paper reveals that core members of NOPs 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 NOPs, 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 NOPs.

4.1 Introduction

The learning abilities of organizations have been the subject of organizational research since the last decades of the previous century (see e.g. Huber, 1991; Levitt & March, 1988; March, 1991; March & Olsen, 1975). Communication between organizational members has been recognized as an important mechanism in facilitating organizational learning (Yuan, Fulk, Monge, & Contractor, 2010). Communication facilitates the sharing, generating and retention of knowledge (Hollingshead, 1998), which in turn is crucial for organizational learning to take place (Schulz, 2001). Hence, mechanisms to facilitate organizational communication and knowledge sharing can have an important contribution to organizational learning (Weick & Ashford, 2001).

In geographically dispersed organizations, *Networks of Practice* are increasingly used to facilitate organizational learning (Agterberg, van den Hooff, Huysman, & Soekijad, 2010; Kane & Alavi, 2007; Pan & Leidner, 2003). Networks of Practice (NOPs) are generally described as voluntary groups in which dispersed people interact around their shared practices (Agterberg et al., 2010; Vaast & Walsham, 2009; Wasko & Faraj, 2005). As members of these networks are geographically dispersed, the interaction between these members primarily takes place via computer-based communication technologies. A NOP thus refers to a group of dispersed people interacting about a shared practice that exists primarily through computer-mediated communication (Wasko & Faraj, 2005, p. 37). *How* NOPs within an organizational setting support organizational learning, however, has received little attention thus far, although recent research does show an increasing attention for the people within these networks and their activities (e.g. Borzillo, Aznar, & Schmitt, 2011; Davidson & Vaast, 2009; Kleinnijenhuis, van den Hooff, Utz, Vermeulen, & Huysman, 2010; Spender, 2007).

In this paper, the focus is on the *core members* of intra-organizational NOPs, and how they contribute to organizational learning. Although the concept of core members has been the subject of research on both online networks and offline communities of practice, this previous research provides limited insight into the role of these core members of NOPs within organizations in terms of contributing to organizational learning. First, although the literature on online networks identifies core members as crucial for the functioning of networks, it tends to define these core members primarily in quantitative terms: as the critical mass (Mockus, Fielding, & Herbsleb, 2002; Wasko, Teigland, & Faraj, 2009), the most active contributors (Desanctis, Fayard, Roach, & Jiang, 2003; Kraut, Kiesler, & Ren, 2007), or on the basis of core-periphery type social network structures (Borgatti & Everett, 2000; Huang & DeSanctis, 2005), without paying attention to who these people are and what they do. Moreover, much of

this literature focuses on informal networks outside of hierarchical contexts, which leaves the dynamics in NOPs within organizations relatively unexplored. Considering the increasing emphasis on knowledge networks as a means to stimulate organizational learning (see e.g. Soekijad, van den Hooff, Agterberg, & Huysman, 2011), this area requires further investigation.

Secondly, the literature on offline communities describes core members as providing intellectual and social leadership by actively contributing expertise and coordinating network activities (Borzillo et al., 2011; Wenger & Snyder, 2000; Wenger, McDermott, & Snyder, 2002), and as playing a key role in supporting learning processes (e.g. Brown & Duguid, 1991; Thompson, 2005; Wenger et al., 2002). Insights from this literature, however, pertain to co-located community members who actively collaborate on shared practices, whereas one of the important aims of firm-based NOPs is to share distributed knowledge, and distributed groups have their own dynamics when it comes to member roles (Whitford & Moss, 2009). Furthermore, learning processes are primarily discussed in terms of individual and community-based learning, without specific attention for organizational learning.

In sum, the literature on both online networks and offline communities emphasizes the importance of core members in the functioning of such groups. This literature does not provide insight, however, into what the role of these core members is in determining the contribution of intra-organizational Networks of Practice (NOPs) to organizational learning. In order to fill this void in the literature, we conducted a multi-methods case study among four NOPs in an international chemical company to answer the following research questions:

1. *Who* are the core members of an organizational NOP?
2. *What* do these core members do?
3. *How* do these core members support organizational learning?

By answering these questions, our paper provides the following contributions to the literature. First, by combining different methods (survey, content analysis and interviews), we provide a rich empirical account of the dynamics within intra-organizational Networks of Practice and their contribution to organizational learning. More concretely, we identify three concrete roles (interpreting, integrating, institutionalizing) that core members perform in intra-organizational Networks of Practice. Finally, we analyze who performs these roles, and how each of these roles contributes to organizational learning at different levels (individual, network and organization).

The remainder of this paper is organized as follows: After 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. In this study, we first identified the core members through a survey, enabling us to identify the most important members of the networks instead of merely the most active members. We subsequently analyzed the activities and learning roles these core members perform through a content analysis of their communication: all 3905 messages posted on the networks. Building on this, we conducted interviews and observations to investigate how these roles relate to the processes underlying organizational learning. We conclude with a discussion of our findings and recommendations for further research.

4.2 Theoretical Background

4.2.1 Core network members and their roles

Although existing theory on core members of networks and communities provides us with useful insights, it offers only limited insight into *who* these core members *are*. Empirical studies on core members in online networks, for instance, 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 & Everett, 2000; Susskind, Odom-Reed, & Viccari, 2011; Whelan, 2007). Studies on offline communities of practice show that about 10 to 15% of the total number of members of such communities are considered to be core members (Wenger et al., 2002, p.56). Core membership is also often related to formal leadership roles (network leaders, transformational leaders, moderators) or management positions (Soekijad et al., 2011; Whitford & Moss, 2009). Other studies, however, discuss how network members can emerge from a group as (informal) leaders as a result of their behavior (Yoo & Alavi, 2004). This is in line with the inherently emergent character of the processes in Networks of Practice (Agterberg et al., 2010; Brown & Duguid, 2001), and thus determines our conceptualization of core membership as an *emergent* characteristic of members, a characteristic that is not automatically connected to their formal position or function but is attributed to them by other members, based on their activities in the network.

That leads us to the question *what* these core members *do* – what are the activities that determine the extent to which they are perceived as core members by the others? O'Mahony and Ferraro (2007) find that network members who are elected as leaders by their peers are

not necessarily responsible for the majority of the contributions to the network, but rather are those who engage in organization-building activities. Other studies emphasize that core members engage in communication with peripheral members (Huang & DeSanctis, 2005; Wasko et al., 2009), acting as a bridge to the periphery, triggering discussion and knowledge sharing (Huang & DeSanctis, 2005), or help maintain network and membership continuity, promoting activity and contributing to a sense of community (Desanctis et al., 2003; Jones & Rafaeli, 2000; Ren et al., 2007; Silva, Goel, & Mousavidin, 2009). Also, an important determinant of core membership in Networks of Practice, seems to be the extent to which one contributes expertise: providing knowledge and experiences related to the common practice (Bergquist & Ljungberg, 2001; Fleming & Waguespack, 2007; Wenger et al., 2002).

So, in terms of who core members are and what they do, previous research does provide us some pointers: core membership is an emergent characteristic, and various activities determine the extent to which one is perceived as a core member. However, the majority of these studies do not discuss specific roles in online networks within an organizational context, since their focus is on online networks in general. Furthermore, the connection between these roles and organizational learning processes is only rarely made explicit.

4.2.2 Contributing to organizational learning: interpreting, integrating and institutionalizing

To explore how core member activities in intra-organizational NOPs support organizational learning, the 4I framework of Crossan, Lane and White (1999) will be used. This framework conceptualizes 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.

Individual level learning occurs when new competences and capabilities about the domain in which one operates are created through social interaction. Group level learning involves the sharing of individual interpretations to develop a shared understanding (Bontis, Crossan, & Hulland, 2002). In our study, these interpretations are shared within the NOP, so group level learning is taking place at the level of the NOP. Organization level learning represents the translation of shared understanding into new products, systems, structure, strategy, procedures, or culture (Bontis et al., 2002; Crossan et al., 1999).

The Crossan et al. (1999) framework distinguishes four learning processes connecting these levels: *intuiting*, *interpreting*, *integrating* and *institutionalizing*. Since *intuiting*

(recognizing patterns and/or possibilities inherent in a personal stream of experience) is a preconscious process, this will not be included in our further discussion since our focus is on processes taking place in the NOPs. *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, p.525). Interpreting occurs at the individual level and precedes the group level. Interpreting encompasses social interaction within a wider network (Dutta & Crossan, 2005) and can be enhanced when one has domain relevant expertise, control of scarce resources and culturally appropriate social skills (Lawrence, Mauws, Dyck, & 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, p.525). This process occurs at the group level and may take shape through communication and the sharing of practices among network 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, p.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’. 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, p.525).

In summary, the extant literature does provide us some pointers on the role of core members in facilitating organizational learning in intra-organizational NOPs, but does not offer a clear insight into *who* these core members are, *what* it is that they do in these networks and *how* this contributes to organizational learning. Therefore, we chose to conduct an interpretive case study in order to further explore our research questions.

4.3 Case Description

We conducted a multi-method case study at an international chemical company, combining a survey, content analysis and interviews. This case was selected because it provides an excellent example of geographically distributed NOPs: the members rely on online communication for interaction and the NOPs are considered successful by the organization’s management in terms of knowledge sharing and learning.

'The Chemical Company' (TCC) produces polypropylene and polyolefin products. Raw grains, produced out of oil residues, are used for the fabrication of different kinds of plastics 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 (spread around Europe, Asia and the Pacific and North and South America) and sales activities in more than 120 countries, the expertise of TCC's 6,700 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 messages, reply to messages, create links to external sources, send and store documents and create polls. Members receive daily updates of activities in their networks via e-mail. 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 join the networks relevant to their daily work. Local managers were asked to commit to promoting participation, but the individual employees decided whether to participate or not. Membership remained voluntary, although some committed managers strongly encouraged their subordinates to join the KX networks. Newcomers to the organization were informed about the existence of the KX networks and encouraged to join them. To gain membership, an online request has to be filled out which is to be approved by the network's management. In practice, these requests were always granted provided that one's daily work was related to the network's topic. On average, the networks had 155 members. More details on the networks are provided in table 4.1.

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 were not compensated. Some moderators were actively involved in the network's interaction, others claimed to have no time to do this and were rather invisible on the network. In practice, these roles were performed by other members as well, for example because they had more expertise or more time, or felt more committed to the network and the common practice.

Networks were monitored by steering committees, which generally consisted of two higher level managers, an IT manager, the moderators and the knowledge exchange manager. These committees monitored participation levels and tried to stimulate the use of the networks by (for example) providing training on the use of the KX network or doing ‘road shows’ to create awareness in underrepresented countries. In addition, a moderator conference was organized once every two years, during which moderators could meet and exchange experiences.

Most postings on the networks related to problems 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 extended social networks in the organization, quicker or better problem solving, and improved 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). An overview of these four networks is presented in table 4.1. 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 and 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 networks’ start in either 2001 or 2002 till May 2006.

4.4 Methodology

An interpretive case study can provide a rich and detailed understanding of a rather new phenomenon, in this case of how core NOP members support organizational learning. While the learning processes of interpreting, integrating and institutionalizing may be considered as (tentative) a priori constructs for organizational learning, there is no pre-developed framework for what makes up a core group of network members or for what they do to support organizational learning. Although a priori constructs are not common in theory-building studies, they are deemed valuable because they help us design our study for investigating the role of core members in organizational learning more accurately (Eisenhardt, 1989). A more detailed explanation of the methods used in our case study follows next.

Table 4.1. Overview of NOPs

	Maintenance	HSE	Supply Chain	Quality Management
Typical topics for discussion	Fixing machine break downs, maintenance procedures for equipment, requests for spare equipments.	Safety incidents, near miss incidents, incident reporting, safety guidelines, health programs, legislation.	Hauler issues, storage problems, SAP related problems.	Incidents of low quality, reporting of quality issues, contamination problems, customer complaints.
Total messages posted 2004-2006	804	1667	685	746
No. of posters 2004-2006	130	196	84	78
Average no. of messages posted by poster	6.2 (SD 10.0)	8.5 (SD 16.0)	8.2 (SD 15.6)	9.7 (SD 14.0)
Average views per poster	24.2 (SD 18.4)	37.3 (SD 27.4)	18.0 (SD 13.9)	19.9 (SD 12.3)
Average replies per poster	.9 (SD 1.4)	.8 (SD 1.3)	1.1 (SD 1.4)	.8 (SD 1.0)

4.4.1 Data collection

Survey. Since we consider core membership to be an emergent characteristic, we identified core members in TCC's networks by means of a survey in which we asked network members to identify the most significant members of their network. With this, 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. 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 (members did not use nicknames) was provided to help recall names and to support the notion that potentially every member could be nominated. In spite of rather low response rates (Maintenance: N = 78, response rate 55%; HSE N: = 53, response rate 27 %; Supply Chain: N = 22, response rate 26%; Quality Management: N = 23, response rate 30%) the data sufficed for our purposes, since the survey results were not used for causal reasoning.

Respondents were representative in terms of their organizational level (19% operational level; 54% operational management level; 27% middle management level; 3% top management level) as well as geographical location.

In addition, an open ended question was asked about why these members were considered most significant for the network. Respondents gave a motivation for 167 core membership nominations.

Content Analysis. Because of NOPs' reliance on online communication, analyzing online communication content is an appropriate method for investigating the activities that core members perform in these networks. Content analysis furthermore provides the advantages of examining rich communication data collected in an unobtrusive manner. Our sample includes all messages (N=3905) 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 4.2 for operational definitions). Categories were inferred from the content of the messages through inductive analyses. When no new codes emerged, results were discussed amongst authors. Some codes were combined as we were unable to attain valid operational definitions. This explorative process resulted in nine different core member activities. Table 4.2 shows the nine categories, their final operational definitions and the reliability of each category. Exemplary quotes for each category can be found in appendix 4.1.

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. Disagreements were mainly resolved by discussion or, if necessary, the first author acted as tiebreaker (Lombard, Snyder-Duch, & Bracken, 2002). It took three iterations of coding, discussion and adjustment to the decision rules to achieve and maintain a final intercoder agreement score of 89%. Intercoder reliability scores above 80% are believed to be satisfying in most situations (Kassarjian, 1977; Lombard et al., 2002), although in explorative studies scores above 70% might be acceptable as well (Lombard et al., 2002). Messages from the samples were re-coded according to the revised rules. In addition, category reliability scores were calculated (see table 4.2). To assure not only reproducibility reliability but also stability

reliability (Kassarjian, 1977), we examined whether the same sample of messages was consistently coded by the same coder over time, which resulted in an intra-coder agreement of 90% for the first coder and a reliability of 97% for the second coder.

Table 4.2. Coding scheme of core member activities

Categories and operational definitions	Category reliability
<i>Ask questions</i> Asking for help, advice or information or the experiences of other members; <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.’	93%
<i>Answer questions</i> Responding to questions posed on the network; sharing expertise;	95%
<i>Broadcast 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’.	80%
<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	84%
<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.	86%
<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.	83%
<i>Brokering between network and formal organization.</i> 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.	88%
<i>Moderate network.</i> 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	95%
<i>Tell others what to do</i> 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.	80%

Remaining messages of the maintenance network were coded by the second coder and the other networks were analyzed by the first coder.

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. Table 4.3 provides an overview of the interviewees per network. Interviews lasted between 45 and 60 minutes and were mostly conducted face-to-face, although 7 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 4.2). 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 & Graebner, 2007).

Table 4.3. Overview of interviewees per network

	Moderator	Mid level member	Top level member
Maintenance	2	1	3
HSE	1	3	3
QM	1	3	
Supply chain		6	
non member		1	

4.5 Results

4.5.1 Who are core members?

The survey results showed that 67 out of 501 members were perceived as significant and thus could be labeled as core members. Significance scores for these core members ranged from a minimum of 1.6% to a maximum of 29.4% of the votes. On average, core members received 7.1% (SD 7.4%) of the votes. Respondents nominated 1.48 people on average (SD= 0.69). From the 67 members perceived as significant for the networks, 13 were deleted from further

analysis because they either worked only on IT support of the KX networks and were not active within the networks themselves, or because they were mistakenly nominated as they were active in a network outside this study's scope, or because they had been active in the past but had left the organization and were no longer active in the networks at the time of our investigations.

The supply chain network has nine core members (6.3% of total members), Quality Management has 11 (14.1% of total members), HSE 14 (7.1% of total members) and the Maintenance network has 20 core members (15.4% of total members), thus making a total of 54 core members with an average of 14 core members per network: 11% of all members. Eleven core members are (or have been) moderators of one of the four networks, 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 considerable 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 deploy within the networks.

Coding and categorizing the motivations respondents gave for their choices resulted in four main reasons why people were seen as significant for their NOP. 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.

4.5.2 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 4.4. The four networks did not differ significantly ($p > .05$) in the extent to which the activities

were performed, save for two exceptions: broadcasting unsolicited was performed more often in the HSE network compared to the other three networks ($F(3,484) = 8.80, p = .000$) and asking questions was performed more often in the Maintenance network than in the other three networks ($F(3,484) = 3.14, p = .025$).

Table 4.4. Occurrence of activities enacted by core members in NOPs

	Maintenance	Health, Safety & Environment	Supply Chain	Quality Management	Total
Ask questions	40 (11.8%)	19 (4.2%)	30 (11%)	33 (8.6%)	122 (8.4%)
Answer questions	166 (48.8%)	160 (35.5%)	120 (44.1%)	157 (40.9%)	603 (41.5%)
Broadcast unsolicited information	18 (5.3%)	115 (25.5%)	32 (11.8%)	48 (12.5%)	213 (15.4%)
Further discussion	31 (9.1%)	61 (13.5%)	42 (15.4%)	65 (16.9%)	199 (14.7%)
Evaluate and capture contributions	31 (9.1%)	30 (6.7%)	5 (1.9%)	12 (3.1%)	78 (5.4%)
Broker to other people or resources	19 (5.6%)	35 (7.8%)	12 (4.4%)	21 (5.5%)	87 (5.9%)
Broker between network and formal organization.	5 (1.5%)	15 (3.3%)	21 (7.7%)	24 (6.3%)	70 (4.8%)
Moderate network.	26 (7.7%)	2 (0.4%)	7 (2.6%)	13 (3.4%)	48 (3.3%)
Tell others what to do	4 (1.2%)	14 (3.1%)	3 (1.1%)	11 (2.9%)	34 (2.3%)
Total	340	451	272	384	1454

To investigate whether and how these acts relate to specific core member roles, the total number of times each act was performed by each core member was calculated. Core member acts were subsequently subjected to explorative factor analysis (Principal Components Analysis with Varimax rotation). Three factors emerged, implying that core members perform 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 “broadcasting unsolicited information” cross loaded on both the interpreting role (.50) and institutionalizing role (.59), this was removed from further analysis, resulting in three roles with factor loadings of .79 or higher, as shown in table 4.5. Together these three roles explain 76% 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 4.5. Factor analysis of learning roles

	Interpreting	Integrating	Institutionalizing
Answer questions	.89		
Further discussion	.87		
Broker to other people or resources	.85		
Ask questions	.79		
Moderate network		.93	
Evaluate and capture contributions		.83	
Broker between network and formal organization			.83
Tell others what to do			.85
Eigen values	3.89	1.38	1.57
Percentage of total variance	43.24	15.29	17.48

Table 4.6 presents descriptives for all variables, and shows that interpreting is by far the most frequently performed role, followed at a considerable distance by the role of “integrator” and finally, the role of “institutionalist”. 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 19 times in their messages. The large ranges found for each role signify substantial differences in the extent to which core members performed each of the three roles.

Table 4.6. Descriptive statistics

Variables	Mean	SD	Range
Interpreting	18.72	22.79	102
Integrating	2.33	4.80	23
Institutionalizing	1.79	4.34	22

To analyze whether core members differ from other members in terms of enacted roles we created a dichotomous variable for non-core members (N= 434) and core members (N= 54). Since the Kolmogorov-Smirnov test indicated non-normality for these variables, a non-parametric Mann-Whitney test was conducted to explore differences between the two groups. Results showed that core members perform all roles more frequently than non core members ($p < .00$).

4.5.3 How core members support organizational learning

Our results show that core members perform different roles, each contributing 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 NOPs. In this section we draw on interview data to provide an in-depth description of how the roles that these key actors perform contribute to each of the levels of learning.

Individual level learning happens when new insights take shape through the process of interpreting, and is defined by Bontis, Crossan and Hulland (2002, p. 443) as “individual competence, capability, and motivation to undertake the required tasks”. Through social interaction new ideas develop and by doing so, new competences and capabilities about the domain in which one operates are created. Numerous examples can be found where individuals develop new ideas through their interaction with their peers. For instance, a process engineer recalled the following idea:

There was a steamer project on another site. Below the side of the steamer, where the condensate is coming out (...) you have the plug of the steamer, the condensator valves we call them; special valves to keep the steam in and the condensate out. But they always get blocked and [site name] had some [solution] to have the same function as the valves have, but not the problems that the valves give. [elaborates on the technical solution given by other site] so the gas cannot go in but the condensate is going in and is circulated. And that solution, I copied. (...) let's say the key idea I copied, but the details of the line system of course not because you have to look at somewhat different things. (...) But I learned this idea from knowledge exchange.
(interviewee 26, member)

The *interpreting process* is defined as the explaining, through words and/or actions, of an insight, or idea to one's self and to others' (Crossan et al., 1999, p.525). Interpreting starts as fellow network members begin to interact and share insights on the online forum:

“[on KX there are] always problems [that] sound like questions and uncertainties or differences of interpretation of instructions that you have from ISO for instance, and also so, yes writing procedures and that kind of thing (...). But the interpretation of that procedure, yeah, isn't always clear. So, then you share it on knowledge exchange and then [discuss] how they deal with that on a daily basis.”(interviewee 19, member)

The sharing of expertise and making contributions in the NOP thus enhances the interpreting process. Besides frequency of contributions, the quality of the contributions influences the value of the interpreting process: core members tend to have high levels of expertise and a

wide social network within the organization. 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. If I see something, 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. 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. Even though these interactions may not result in shared understanding, individual members may still derive value from the group’s interactions.

“For me the most important thing is, if I have a problem which needs to be discussed on the KX, that I get an answer, get a solution and most of the time this happens. I can’t think of any issue which has not received an answer because the answer can be anything... It can also say well, contact your helpdesk or contact your local infrastructure team or something like that. That can also be an answer because it cannot be solved within the group.”(interviewee 13, member)

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 are particularly active in explaining their ideas as well as highly skilled in explaining ideas and suggestions or finding topics of importance to the broader network.

Network level learning. Group (or network) learning, defined by Bontis et al. (2002, p. 443) as “group dynamics and the development of shared understanding,” 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 is found in 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 used specific precautions and if they had ever had any customer complaints. After a vivid discussion among nine members they finally came to the following understanding:

“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).

The *integrating process* is defined as "the process of developing shared understanding among individuals and the taking of coordinated action through mutual adjustment" (Crossan et al., 1999, p. 525). Discussions from the interpreting process may naturally flow into the integrating process if, for example, shared understanding of 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 moderators: except for one, all moderators nominated as core members performed at least the integrating role. Integrating activities (partly) resemble a facilitator or moderator role as described in the 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 a very frequent activity. This is not surprising of course, because such integration of content is by definition infrequent, something that takes place every now and then after sufficient content has been generated to evaluate and capture. One respondent motivated his nomination for a core member as follows: "*If the discussion is running nowhere, she dares summarize the main points and 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 these and these 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 turn 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 shared understanding 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, 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. As the moderator declared in the message in which he nominated this contribution for “article of the year”:

“Through the discussions information came out pertaining the type of predictive maintenance and frequency of this predictive maintenance. The potential is there to utilize this article to develop a best practice.”

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.

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 a question posed by one of the

core members was picked up by another, which ultimately led to the release of new global guidelines and as such changed work processes throughout the organization.

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's 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's news Magazine, third Issue 2005).

The *institutionalizing process* is defined as 'the process of embedding learning that has occurred by individuals and groups into institutions of the organization including systems, structures, procedures and strategy' (Crossan et al., 1999, p. 525). As the above excerpt shows, organization level learning is fostered by people who broker between the formal organization and the network. In other words, 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 quote, 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)

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 integrate 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, he brokered between the network and the formal organization and

consequently contributed to organizational learning. Besides taking insights from the network to the organization, 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 enable organizational level learning. As these roles are less frequently enacted, however, most learning remains on the network level. 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)

4.6 Conclusion and Discussion

Our study showed that, in line with studies on core members of other groups (e.g. Wenger et al., 2002) about 11% of NOP 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 position in the formal organization. These core NOP members collectively help their NOPs contribute to organizational learning. 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 NOP, predominantly supporting network level learning. Core members supporting the process of *integrating*

facilitate network level learning by integrating both the connections between the NOP 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.

4.6.1 Implications

Our findings show that members collectively help the NOP 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, Nemanich, Waldman, Galvin, & Keller, 2006; Vera & 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 depends on a group of core members, perceived as the “core” based on their activities in the network. By considering core membership in intra-organizational NOPS as an emergent and attributed characteristic of NOP members, we contribute to the literature by identifying core member roles that are specific for NOPS in an *intra-organizational* setting, and that are specific in terms of contributing to *organizational learning*.

Our first contribution lies in identifying core member roles that are specific for intra-organizational settings. Literature on online knowledge networks usually points out the importance of those members making the largest number of contributions (Desanctis et al., 2003; Mockus et al., 2002; Ren, Kraut, & Kiesler, 2007) and those facilitating or organizing the network (Desanctis et al., 2003; Jones & Rafaeli, 2000; Ren et al., 2007; Silva et al., 2009). While we have found that core members in intra-organizational NOPS do perform such activities too, we have identified a combination of roles that is specific for knowledge networks within hierarchical settings. On the one hand, the *interpreting* role is typical for informal, emergent networks in which the emphasis is on establishing and communicating about a shared practice (Agterberg et al., 2010; Brown & Duguid, 2001; Thompson, 2005). On the other hand, the *institutionalizing* role is characteristic for the hierarchical setting in which intra-organizational NOPS function, where the integration of dispersed knowledge into institutional know-how is crucial (Grant, 1996; Zollo & Winter, 2002). The *integrating* role relates to both the emergent and the hierarchical element of intra-organizational NOPS. On the one hand, integrators help in explicating the shared practice, establishing a shared understanding of what that practice is and how different contributions are related to that practice. On the

other they hand organize the group, guard the norms, and take the lead in formulating and undertaking joint actions that will most often be aligned with organizational goals and interests. Thus, the combination of these three roles is typical for intra-organizational NOPs, and identifying these three roles contributes to our understanding of how members of these networks function within organizations.

As a second contribution, the roles discussed in this paper are specific in terms of organizational learning. We have specifically identified core member roles in terms of their contribution to individual, network and organizational level learning, which contributes to our understanding of how intra-organizational NOPs can facilitate learning in organizations. Core members connect the different levels of learning through these roles, and thus play a crucial role in linking individual, practice-based learning, through network-level level, to organizational knowledge. Core members facilitate these learning processes by focusing on the content being generated and shared, as well as on the connections between network members.

The importance of core members linking network level learning with organizational level learning has, to our knowledge, not been identified before in literature on online knowledge networks. As 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 NOPs, but rather “depends on interested actors who work to embed [this] in routines, structures and cultures of the organization” (Lawrence et al., 2005, p.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. Interestingly, the active involvement of higher management was found to have a positive influence on the networks’ contribution to organizational learning, while this is usually considered counterproductive for informal and practice based knowledge sharing to occur (Agterberg et al., 2010; Hayes & Walsham, 2001; Thompson, 2005). Our study indicates that acting as a boundary spanner between the content generated in the network and the formal organization is not detrimental for knowledge sharing dynamics per se; in fact these activities are related to being regarded as a significant member of an NOP. 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 involvement (Brown & Duguid, 2000). In our study, core members supporting the institutionalizing process apparently do not face such a management dilemma. Instead of 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.

Next, while our study supports the role of moderators or ‘integrators’ in connecting network members, our specific focus on organizational learning in intra-organizational NOPs led us to identify a new set of facilitating activities not discussed in theory on moderators so far (Desanctis et al., 2003; Jones & Rafaeli, 2000; Kraut et al., 2007; Silva et al., 2009): 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 & Rafaeli, 2000; Kraut et al., 2007; Silva et al., 2009) their role in supporting organizational learning has not been acknowledged so far. Intervening in either content or connections constitutes two possible managerial interventions for stimulating knowledge integration in NOPs (Agterberg et al., 2010). The core members in our case perform both types of interventions, thus stimulating network-level learning without having a formally assigned role to do so.

With regard to “integrators” intervening in the connections between NOP members, however, 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; Panteli & Sockalingam, 2005; Wasko & Faraj, 2005) the networks in our case show a relative lack of socially oriented activities – connections are important, but primarily based on content. Very little attention was paid to group identity formation, trust issues, face-to-face meetings or social talk. While we have identified the act of brokering in our content analysis, it more often encompassed referring to resources for knowledge than referring to other people. One explanation for this lack of relationally oriented behavior might be that in organizationally embedded NOPs the context of the organization 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 NOPs (Faraj & Johnson, 2010), thereby overruling the importance of strong ties. This finding calls for more research on the role of social behavior in organizationally embedded NOPs.

Our last contribution is to theory on organizational knowledge sharing groups. Most studies on these groups focused on local situations (e.g. Bechky, 2003; Duguid, 2005; Wenger

& 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 & Walsham, 2009), or on IT use (Hayes & Walsham, 2001; Olivera, Goodman, & Tan, 2008; Vaast, 2007; Vaast & 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.

4.6.2 Limitations and further research

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 NOPs for organizational learning purposes, more research on core NOP members and the activities and learning roles they perform would be highly welcomed. First, extending this research to more, and other organizations will clarify to what extent the core member roles we have distinguished (and their contribution to organizational learning) can be found across different organizations. Furthermore, although the content analysis in our paper concerned data collected over a longer period of time, our analysis is not a longitudinal one. An in-depth, longitudinal analysis of the exchanges in an intra-organizational NOP might be valuable in terms of improving our understanding how core members emerge (and possible change) through time, how the different roles they fulfill in terms of facilitating organizational learning may develop (for instance, do core members that emerge based on interpreting activities gradually take on more institutionalizing responsibilities as well?), and how organizational learning is influenced by these roles.

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Appendix 4.1: Exemplary messages of core member activities

Ask questions

Network: HSE
Subject: Nitrogen hazard in extrusion building

Brindisi site

In the extrusion building nitrogen is currently used for blanketing of feed hopper and powder feeds, flushing of seals (screw feeder, mixer, rotary feeders, LW polymer feeder, purge of peroxide lines, etc.). In the past there were also nitrogen utility stations, but they have been definitively blinded (see SDC, C3.7). Considering the nitrogen hazard in case of losses, our "barrier" is that extrusion building has windows in the upper part of walls, along the whole length, kept normally open, as well as the doors.

We'd like to know how other plants are dealing with this hazard.

Thanks in advance

Answer questions

Network: Maintenance
Subject: TPP P-4200 information

Dear P. Sorry for late reply because I just return to office today after six days Chinese Lunar New Year holidays. Your HMC2 Prepoly Reactor Pump is similar to TPP4's P-4200. I think you are asking about throat bushing. Yes, there are twenty-two 60 degree grooves (0.65 mm depth at 1.2 mm pitch) at the inner bore of the throat bushing. I guess the function of these grooves is similar to labyrinth. The clearance between the throat bushing and pump shaft is about 0.5 mm to let the flushing propylene passing through. The pressure of propylene flushing should at least 1.38 bar greater than the discharge pressure of P-2200. TPP also experienced mechanical seal failure due to flushing pluggage caused by reaction runaway. The KW of P-2200 went fluctuating may be the consequence of abnormal reaction. I don't how to verify whether the flushing is clean or not. At normal, the MTBF of P-200 is about three to four years if the operation runs well. Please don't hesitate to contact me if you have more questions. Best regards, C.S.

Broadcast unsolicited information

Network: HSE
Subject: Recordable Injury at Jackson - Restricted Work Case

On July 17th an employee stood up into a low hanging vent pipe and was diagnosed with a sprained neck at the local hospital (the employee was wearing a hard hat at the time of the incident.) The employee was given a release to return to work with no restrictions based on the diagnosis and negative x-ray results. A few days after the incident occurred the employee began to complain of intermittent numbness in his extremities which prompted a visit to a neurologist. Fortunately the employee does not have any neurological damage, however he was diagnosed with a soft tissue injury to the neck. He has been placed on light duty for 2 weeks and prescribed a muscle relaxer as well as work conditioning physical therapy. A tripod investigation will be conducted on the incident.

Further discussion

Network: Maintenance
Subject: Sound Enclosure for HC Compressor.

Clyde has a similar heat pump PP Splitter, and only has acoustic insulation surrounding the gearbox as the noise level from the compressor is acceptable. The main source of noise from the Clyde equipment is fluid flow. Can I ask what are the sources of the noise? Is it the fluid flow through the piping, the compressor, or the gearbox (if any)? If it is the fluid flow, is it due to excessive bends, the selected valving (high DP/noise), minimum sized pipe diameters (high velocities)? If it is not possible to change these now, can insulation of the piping reduce the noise transmission, rather than creating a potential safety hazard? A. B.

Evaluate and capture contributions

Network: Quality Management
Subject: Overview list of all findings up to 8 mar 04

Dear all, I have put in one overall table the findings of the external DNV audits

reported so far in the KX. It might be useful to see if there are any recurring issues and check the number of OFI/OBS vs NC's. You can also detect a different behavior amongst the auditors.

Broker to other people or resources	<p>Network: HSE Subject: Varennes reply to risk recognition training</p>
	<p>A neighboring plant has had good results with a program called [name program] from [name company]. The program focuses on the recognition of four basic mental states (rushed, frustrated, tired, and overconfident) and four basic error types that can result from these states of mind (inattention, distraction, line of fire, and loss of equilibrium or slips). The contact information that I have is as follows:</p> <p style="text-align: center;">[contact details person]</p>
Broker between network and formal organization	<p>Network: Supply Chain Subject: STOP DISCUSSION - discussion passed to Elop meeting</p> <p>Thanks all for contributions on this topic. As you will have read, every site has its own PPE requirements and ways to control their fulfillment. It is not up to this group to decide on which requirements and ways of control are to be implemented without agreement from site mangers and HSE department. I will take this to the ELOP meeting and inform if any changes or best practices come out.</p>
Moderate network	<p>Network: Maintenance Subject: Master Who is Who</p> <p>Attached is the Master Who is Who List for the Maintenance Network. To the best of my knowledge it is up-to-date. If you find a mistake or if you are new to the network please let me know. Items that are in red have not to my knowledge been verified.</p>
Tell others what to do	<p>Network: Supply Chain Subject: Adhesive labels for European Production Sites</p> <p>Please provide details of all occasions where adhesive labels are used during the bagging operation either for the bags themselves or as pallet labels stuck onto the outer shrink/stretch wrap. If you do not use any labels please also indicate that as well. Please let me have all responses before 6.2.2004 as the data is required for an urgent project which might require re-programming of SAP Thanks A.</p>