

Keeping the Wheels Turning: The Dynamics of Managing Networks of Practice

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ABSTRACT Intra-organizational networks of practice (NOPs) confront managers with a dilemma: they must manage NOPs to reap benefits from integrating geographically dispersed knowledge, but the inherently emergent nature of NOPs implies that management control may frustrate practice-related knowledge to be shared. Based on a case study of 22 NOPs in a geographically dispersed development organization ('TDO'), we develop a model that disentangles the dynamics underlying this dilemma, helping to better understand it. Specifically, four dynamic relationships are interrelated and involve four kinds of embeddedness (organizational, in practice, relational, and structural) that relate dynamically to knowledge sharing in NOPs. Interventions in both the *content* shared in the network and the *connections* among network members can influence each of these relations. This study contributes to theoretical and practical understanding of how to manage NOPs without killing them.

INTRODUCTION

Globally dispersed organizations, such as multinational enterprises, typically confront a pressing need to integrate knowledge that is geographically dispersed to create and appropriate value (Foss and Pedersen, 2004; Kogut and Zander, 1993). The practice-based perspective of knowledge suggests that networks of practice (NOPs) may serve as vehicles that can integrate such dispersed knowledge (Brown and Duguid, 2001; Tagliaventi and Mattarelli, 2006). These NOPs involve knowledge networks of individual members who share the same practices but are geographically dispersed (Brown and Duguid, 2000b, 2001; Faraj and Wasko, 2001; Ormrod et al., 2007; Teigland, 2003; Vaast, 2004). In this sense, NOPs are inherently emergent, self-organizing structures that thrive on the interaction of people who act within a particular shared context or practice (Brown and Duguid, 2000b, 2001). Thus, the NOPs can integrate dispersed knowledge without extracting it from practice (Tagliaventi and Mattarelli, 2006).

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Intra-organizational NOPs often result from an explicit aim to integrate geographically dispersed knowledge. For example, companies such as Shell (Wenger et al., 2002), BP Amoco (Collison and Parcell, 2001; Prokesch, 1997), Siemens (Nielsen and Ciabusch, 2003), Unilever (Rumyantseva et al., 2006), and Buckman Laboratories (Pan and Leidner, 2003) have introduced or formalized NOPs to support connectivity and knowledge sharing among dispersed employees. Such intra-organizational NOPs create a dilemma for managers though: on the one hand, managerial control is necessary to ensure the benefits of NOPs, but on the other hand, their inherently emergent nature implies that managerial control over the networks will likely to frustrate members' spontaneous desire to share their geographically dispersed practice-related knowledge (e.g. Alvesson et al., 2002; Thompson, 2005).

This article attempts to increase understanding about managing intra-organizational NOPs for knowledge integration. Specifically, we contribute to (knowledge) management literature by describing and unravelling the management dilemma and thereby explain the difficulties associated with managing NOPs. Disentangling the dilemma also clarifies existing literature that debates whether integrating dispersed knowledge requires management intervention or leaving NOPs, as emergent structures, alone. Furthermore, we provide insight into how management interventions that influence the *content* and *connections* of NOPs contribute both positively and negatively to knowledge integration.

We adopt a theory-building case study approach (Eisenhardt, 1989) and thereby endeavour to generate theoretical understanding of the management of intra-organizational NOPs. Central to this interpretative approach is a case study that we conducted within an international development organization, referred to herein as TDO. Before we introduce the case study, we provide a theoretical elaboration of the central management dilemma. After we elaborate on our case study and capture the main results in a model we develop on the basis of the data, we discuss the implications of our theoretical model for current literature and further research and provide some managerial implications.

MANAGING NETWORKS OF PRACTICE: A MANAGEMENT DILEMMA

Managing intra-organizational NOPs involves two contradictory management roles. Managerial interventions are required, because organizations primarily use these networks to integrate dispersed knowledge (which reflects organizational value). Yet the networks are strongly self-organizing and emergent in nature, independent from (or even negatively influenced by) interventions by management (Alvesson et al., 2002; Thompson, 2005). We explore the theoretical underpinnings of this dilemma to derive the focal research question.

According to the knowledge-based view of the firm, an organization must manage dispersed knowledge within the organization by integrating it (Grant, 1996b, 2002; Spender, 1996, 1998). To improve organizational learning, innovative capabilities, or competitive advantage, an organization somehow needs to integrate its dispersed knowledge (Grant, 1996a), which is 'knowledge not given to anyone in its totality' (Hayek, 1945, p. 520). Existing mechanisms, including organizational hierarchies, contractual obligations, monetary incentives, or mandated rules and regulations (Martinez

and Jarillo, 1989), are inappropriate because they integrate formal structures, such as business units, instead of knowledge. Integrating knowledge requires informal, less explicit, yet more complex mechanisms (Martinez and Jarillo, 1989). Although knowledge management literature offers some important insights, we still know little about how organizations actually integrate their dispersed knowledge (Foss and Pedersen, 2004), which suggests the need for a better understanding of the role of *managing* dispersed knowledge.

The practice-based view of knowledge (Brown and Duguid, 1991, 2001; Cook and Brown, 1999; Gherardi, 2001; Lave and Wenger, 1991; Orlikowski, 2002) suggests that communities and networks of practice provide appropriate coordination mechanisms for integrating dispersed knowledge (Brown and Duguid, 2001; Hislop, 2002; Scarbrough and Swan, 2001), with the assumption that knowledge sharing takes place when practices are shared in a rich and meaningful way (Hislop, 2005). Communities of practice (COPs) originally were defined as emergent collections of closely connected (tightly knit) persons who engaged in frequent, social, face-to-face interactions, working side-by-side, and shared a common situated context or practice (Wenger, 1998). Networks of practice (NOPs) similarly are self-organizing groups of members who share the same practice but are geographically dispersed. Moreover, compared with COPs, NOP members are more sparsely connected through weaker social ties and less interaction, possibly supported by information technology tools (Brown and Duguid, 2001; Faraj and Wasko, 2001; Tagliaventi and Mattarelli, 2006; Teigland, 2003; Vaast, 2004). In some contexts, NOPs serve as boundary spanners that enable the integration of dispersed knowledge, such as by connecting people who share a common practice but work in different professional groups (Bechky, 2003; Tagliaventi and Mattarelli, 2006) or different organizations (Brown and Duguid, 2001; Faraj and Wasko, 2001), as well as people who are geographically dispersed (Landqvist and Teigland, 2005; Vaast, 2004).

The practice-based perspective tends to ignore managerial issues though or criticizes management by framing its role in terms of stewardship (Wenger, 1998), care (Von Krogh, 1998), cultivation (Ward, 2000), nurturance (Alvesson et al., 2002), or fine-tuning (Alvesson and Kärreman, 2001), in a similar way that innovation needs a balance between exploration and exploitation (Raisch and Birkinshaw, 2008). This brings us to the central dilemma faced by knowledge management researchers and practitioners: how to balance between emergent self-organization and autonomy on the one hand (a crucial principle in the practice-based view on knowledge) and some degree of formal management influence or control on the other hand? This is similar to what Brown and Duguid (2000a) refer to as 'balancing between process and practice'.

Knowledge management literature thus cannot sufficiently explain yet how organizations deal with these conflicting demands, nor does it suggest how organizations might manage NOPs. This study aims to disentangle this management dilemma by identifying different underlying dynamics that may play a role in knowledge management through intra-organizational NOPs. Thus, with our interpretive case study, we attempt to answer a key research question: *How can intra-organizational NOPs be managed without being killed?*

CASE STUDY

We conducted an in-depth case study with ‘The Development Organization’ (TDO), a geographically dispersed development aid organization founded in 1965 and headquartered in the Netherlands. The organization is active in five regions – Balkans, Latin America, Asia, West and Central Africa, and East and Southern Africa – that comprise 32 countries. Since its start as a voluntary aid organization focusing on helping the poor, TDO has evolved into a professional consultancy organization with more than 1500 professional employees. It has adopted the routines and rhetoric of the consultancy industry, referring to employees as advisors, organizing its work into ‘practice areas’ (PAs), and communicating its mission in terms of ‘developing and connecting capacity’. Its employees advise local organizations, including non-governmental organizations (NGOs) and local government agencies, on issues pertaining to poverty, droughts, deforestation, and HIV/AIDS. The work of TDO advisors is knowledge intensive and diverse; for example, advisors require knowledge about institutional development (e.g. dealing with local governments, partnership building, client management), advisory skills and thematic knowledge in specific PAs (e.g. Poverty, Local Governance, Tourism). Notwithstanding different (local) practices, TDO employees are bound by their strong commitment to alleviating poverty.

In 2004, in line with TDO’s ongoing professional aspirations, management decided to initiate formalized knowledge networks on specific topics, such as HIV prevention and women’s rights. Twenty-two formalized NOPs focused on different local PAs, with the managerial goal of integrating existing, dispersed knowledge – in their words: ‘to leverage the knowledge potential in the organization’ (according to a TDO strategy document). Management created the formal position of a PA manager, or functional line manager who is responsible for a PA in a region. Network leaders would additionally function as champions or facilitators. The organization assigned budgets to organize meetings and hire moderators and provided an information infrastructure based on E-Groups, the organization’s online discussion platforms for advisors.

For example, one NOP is the *Poverty network* in West and Central Africa. Before 2004, a rather loosely coupled network of TDO professionals existed in this field, but after the formalization, a PA manager facilitated the network, both face-to-face and online. Advisors previously had worked more or less in isolation from one another in small, local TDO offices, with little contact with either the head office or their colleagues in the region. Through the dedicated E-Group, network members could connect with other colleagues in the field and discuss, for example, ways to influence the cashew nuts value chain to ensure honest and sustainable income for all parties, including farmers, cleaners, and shop owners, as well as the regional cashew markets and exporters.

The *Drought network* similarly had been in existence before its formalization in 2004. Members in West and Central Africa work on agriculture and livestock or pastoralism and try to assist wandering shepherds, who often cross geographical borders and confront severe hostility. To help these groups, advisors must cooperate with colleagues in other countries and even other regions, an effort facilitated by the E-Group and face-to-face meetings (usually twice a year).

Forestry network advisors, in contrast, tend to have a strong local focus because they regard their local practices as too specific for more global knowledge sharing. Therefore, they have little contact with forestry experts in other regions. TDO decided to install a forestry network in 2004 to induce more global knowledge sharing among these forestry experts.

Methodology

The 35 semi-structured interviews we conducted with various active TDO employees worldwide lasted approximately 60 minutes each. The interviewees include formal managers, such as members of the board of directors or those working at the head office (13), network leaders and PA managers (14), and network members (8). During the interviews, we discussed the organization of NOPs (e.g. timeline, development, activities, knowledge sharing, results), the role of management, and how NOP activities and participation relate to day-to-day work. We asked for concrete examples and stories but did not actively direct the discussion or suggest how respondents might answer. These data are valuable; as Giddens (1984) notes, people are more knowledgeable and reflexive about what they do than researchers often give them credit for being. We used the Atlas.ti software package to structure and code the fully transcribed interviews. If recording was not possible, as in 10 additional, spontaneous, informal interviews with network leaders and members, we took careful notes during and right after the interview and used these notes in the coding process. With the theoretical idea of the managerial dilemma as our basis, we delved deeper into the material through open coding. When no more new codes emerged, we switched to axial coding.

We also collected data pertaining to face-to-face and online knowledge sharing in the NOPs. We obtained observations in Ouagadougou, Burkina Faso, during face-to-face meetings of three networks that were active in the West and Central Africa region, at local TDO offices, and during a visit to a client NGO. By staying at the same hotel as many TDO employees who attended these network meetings, we were able to interact with them in different (social) settings. We also analysed the content of messages posted to the E-Groups; or log files (i.e. e-mail lists for online knowledge sharing) to determine what the network members were talking about in these groups and identify their patterns of communication. To complement these data, we analysed organization reports, minutes, and policy documents, as well as the results of a descriptive survey that TDO commissioned us to conduct (N = 475, response rate = 53%).

Triangulating the different data sources confirms the convergent validity of our analysis. We checked the data from the E-Group content analysis with the interviews and survey to confirm how members used the E-Groups and what knowledge they shared. For the interviews, surveys, and log files, we adopted a global perspective and spread our attention across all 22 NOPs. We provide an overview of the collected data for each network in the Appendix. The survey and log files only describe the networks in general terms, whereas the interviews and observations provide the primary sources of data for insights into the management dilemma. Obviously, we collected more data than we can discuss herein, and thus, we focus on the role of management of NOPs. Among the NOPs, we select three polar cases to describe in depth (Eisenhardt and Graebner, 2007). These NOPs reveal the wide variety of managerial interventions and dynamics.

During a management meeting at the head office and regional meetings in various countries, we reported our initial findings to TDO. Various advisors and managers confirmed that our findings corresponded with their personal impression of the dynamics related to the networks, in support of the communicative validity (Sandberg, 2005) of our results.

Managing TDO's Networks of Practice

Our case study addresses the research question that guides this research: *How can intra-organizational NOPs be managed without being killed?* Our field data reveal four sets of interrelated dynamics that influence the way NOPs integrate dispersed knowledge. These dynamics pertain to the different forms of *embeddedness* of a NOP. The *American Heritage Dictionary* defines 'embed' as 'causing something to be an integral part of a surrounding whole'. We distinguish four forms of embeddedness: two that refer to the embeddedness of knowledge in a certain environment and two that indicate the embeddedness of network members in the network:

- (1) *Organizational embeddedness*: the extent to which the knowledge shared in the network is relevant for and integrated in the formal organization.
- (2) *Embeddedness in practice*: the extent to which the knowledge shared in the network is relevant for and integrated in the dispersed, local practices of network members.
- (3) *Relational embeddedness*: the extent to which the network is characterized by strong social ties (Granovetter, 1985) and elements such as trust, mutual expectations, and identification (Nahapiet and Ghoshal, 1998).
- (4) *Structural embeddedness*: the extent to which network members are connected to one another (Granovetter, 1985) and know who knows what and how to reach them (Contractor and Monge, 2002; Nahapiet and Ghoshal, 1998).

Embeddedness thus is a characteristic of either the *content* being exchanged in a network (embeddedness of the knowledge in the organization and in practice) or the *connections* in that network (embeddedness of the members, either relational or structural).

Knowledge sharing in networks relates to the sharing of experience and expertise among network members. From our data, we derived four related activities: asking questions, responding to questions, providing unsolicited information, and observing an interaction. Such activities also appear frequently in the interviews as examples of what happens in networks. By sharing experiences and expertise, advisors create new knowledge. In Table I, we provide an overview of the elements of knowledge sharing, with illustrative quotes.

As we explain in our in-depth analysis of our findings, each form of embeddedness relates dynamically to knowledge sharing in a NOP. Moreover, our findings indicate that management can *intervene* in each of these dynamics, which can have different impacts by either enforcing the dynamics, which leads to higher levels of embeddedness and increased knowledge sharing, or degrade the dynamics, which prompts lower levels of embeddedness and decreased knowledge sharing.

Figure 1, which we employ and develop throughout this section, summarizes these dynamics and the interventions associated with managing NOPs. We illustrate the

Table I. Knowledge sharing

<i>Concept</i>	<i>Subconcepts</i>	<i>Definition</i>	<i>Exemplary quotes</i>
Knowledge sharing	Asking questions	Posing questions to the other network members	'For example on the E-Groups, what is working very well, is for example . . . I work . . . or John works in Bolivia, in Santa Cruz, and has a client, and he has to make a planning, and I don't know . . . a strategic planning with a client, and doesn't know exactly which method is most suitable. So he writes: Well, I am working with a client in such and such sector and want to do a planning with them, who has experience with a similar client?'
	Responding to questions	Responding to questions or issues raised by other members, ranging from simple answers to complex discussions	'It is quite easy [in the network] to get to know who is doing what. If I would ask that question, then I would pretty soon get answers from several colleagues about "who knows what and where I should go". . . . So if I need something, I ask for it, and get it. So that is really special.'
	Providing unsolicited information	Providing unrequested information to other network members	'It is not really something where people pose questions they have with their clients, the issues they have with their clients. It is more information exchange, so if people meet people, or a document that might be of interest for other people, they post it [on the network].'
	Observing the interaction	Observing what is going on in the network (questions asked, questions answered, and unsolicited provided information), with the aim to learn from it	'Such an E-Group is really to, well, to browse the site, there is a very big resource section . . . and that was also noticed, that it is a really useful medium for new people, who come in as an advisor. They, well, they immediately . . . you can log-on to the E-Group, and get an overview of the people working there, and you scroll through the names, you can read what kind of introduction they have done, you can see what documents have been posted, you can download, so that's all very useful.'

dynamic character of the relationships among the different elements by depicting them as wheels, connected by bands, which emphasizes that these relationships can be both reinforcing and degrading, depending on the direction the wheels turn.

Organizational embeddedness. We use the term *organizational embeddedness* to denote the extent to which the knowledge being shared and created in NOPs is integrated in and relevant to the organization of which these networks are a part. In Table II, we summarize the different elements of this concept and provide some exemplary quotes.

The interviews indicate that management's primary aim in relation to the networks is to institutionalize knowledge shared in those networks in the form of new routines,

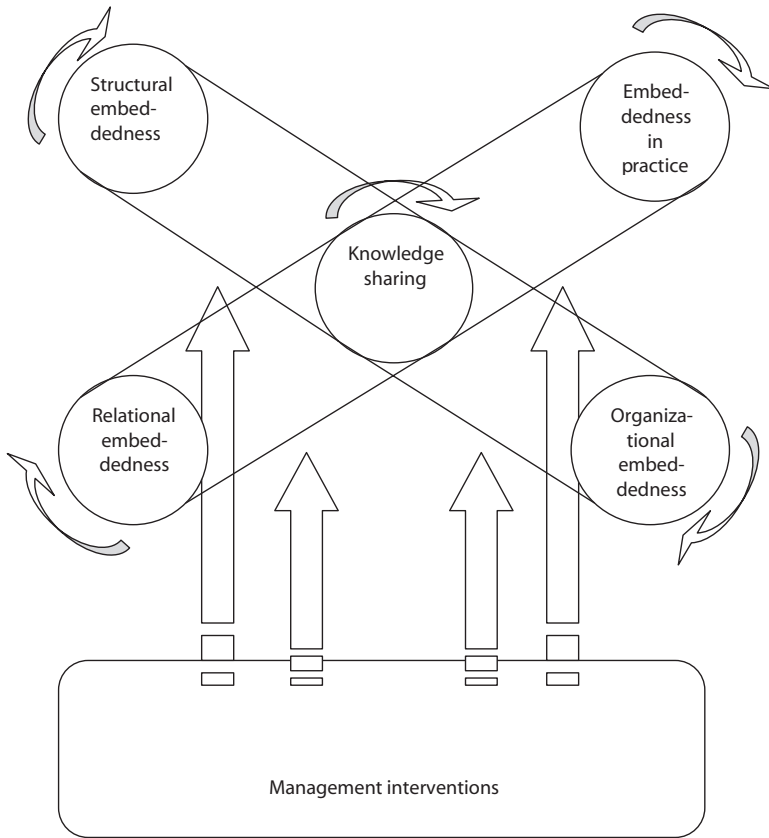


Figure 1. Managing intra-organizational networks of practice: dynamics and interventions

Table II. Organizational embeddedness

<i>Concept</i>	<i>Subconcepts</i>	<i>Definition</i>	<i>Exemplary quotes</i>
Organizational embeddedness	Institutionalization	Extent to which outcomes of the network can be applied in the formal organization as rules, routines, strategies, etc	‘And that output has been incorporated in what we finally called the regional intervention strategy for local governance.’
	Relevance for organization	Extent to which knowledge sharing in the network is considered valuable for the organization	‘So in 2005 that [request to write strategy papers] was officially started, and that simply was not that successful. So the things that came out of that, August 2005, were actually not very good.’

guidelines, procedures, strategies, or best practices. This institutionalization might take the form of standardization through training, as one respondent reports:

For instance, the analysis of production chains: that's something we did very differently in five countries, and because we connected the different experiences and derived lessons learned from those, we made a publication that shows you how to do such a thing. That publication was amended with training, first internally for advisors from the region. Fifteen advisors participated in that, and they all diffused the method in their own countries by means of courses. (Interviewee 16, Network Leader, Poverty, Latin America)

Most of the interviewees' remarks related to (successful) organizational learning indicated similar attempts to standardize practices, focusing on 'upscaling' tested practices from a single network or region to the organization as a whole or replicating successful interventions. However, the degree of organizational learning in TDO appears disappointing, according to a respondent from the head office:

To know whether [bringing advisors together in the networks] is effective . . . more should come out of the networks than has happened so far. You must have heard about our practice area drill held last year. The quality of that, well, to put it very mildly, was not optimal. In the end, I think the groups did not succeed to come up with manageable strategies. We have analysed this whole process and the outcomes are exemplifying for this. So yeah it is very good that people sit together . . . , but it has not been fruitful yet. (Interviewee 15, Strategy Unit, Head Office)

We found a dynamic relationship between organizational embeddedness and knowledge sharing. As more knowledge gets shared within a NOP, more knowledge can be institutionalized within routines and practices. The institutionalization of knowledge also positively influences the sharing of knowledge in the network, because institutionalization affirms the importance of network activities. This dynamic can both be self-reinforcing (more knowledge sharing leads to more organizational embeddedness, and vice versa), or it can be degrading, in the sense that less sharing correlates with less embeddedness.

Management interventions in organizational embeddedness. For the NOP to contribute to knowledge integration, the dynamic needs to be self-reinforcing. Our data provide several examples of management interventions designed to create such a self-reinforcing dynamic, such as translating experiences into formal publications and training. Similarly, management's decision to use the networks to contribute to organizational strategy development required that soon after formalization, members delivered specific input to create strategy documents for their practice area, in line with the head office's aim to increase professionalism. The following excerpt from the log files illustrates this goal:

In brief: apart from the present activity descriptions, I ask you to prepare a strategy or positioning proposal for your country, based on a quick and dirty analysis regarding the service areas that are not yet covered by TDO in your country. These proposals

will be discussed and used as input during the first two days of our workshop. (PA Manager, Poverty, West and Central Africa)

Management thus tried to exert more control over the knowledge being shared, perhaps by setting the agenda. Most head office managers believed that the networks should have bigger goals than ‘just’ solving daily problems and argued that network members should contribute to strategic plans and reports.

Although some of these interventions, such as translating lessons learned, seemed well received, others were not. Asking the networks to formulate strategies, for example, reportedly had detrimental effects for both the networks and the head office. This latter finding relates strongly to the concept of embeddedness in practice.

Embeddedness in practice. When we asked about what motivates people to use networks for their knowledge sharing, many interviewees referred to the importance of practice-related knowledge. The *embeddedness in practice* construct thus refers to the extent to which the knowledge being shared and created in NOPs is integrated in and relevant to members’ local practices and thus contributes to these practices. In Table III, we illustrate the different elements of this concept.

The extent to which network activities relate to and are integrated in the daily practices of individual members is certainly not a given, nor is it explicitly taken into account by management. For example, within the Poverty PA, members varied greatly in their knowledge interests: some work on value chains for cashew nuts, others with milk farmers, and others in the tourism industry, which results in different backgrounds, problems, focal legislation, and clients. Because of these divergent local practices, some members believe they have little knowledge to share with their fellow network members, who seem to speak different ‘languages’. The different local contexts thus hinder their ability and motivation to share knowledge, and the topics discussed in the network appear less valuable for their daily practices. Thus, the members perceive that the networks sometimes have an overly broad scope:

Table III. Embeddedness in practice

<i>Concept</i>	<i>Subconcepts</i>	<i>Definition</i>	<i>Exemplary quotes</i>
Embeddedness in practice	Relevance to practice	Extent to which knowledge sharing in the network is immersed in the daily local practices of members	‘People want really practical, day-to-day, exchange. And especially because in our network it is not like “I have a problem in my daily work with a client or so and I bring it to the network”. So yeah it is not that useful.’
	Common practices	Extent to which the network members use the same practices	‘It regularly comes up in the discussion: for me it is useful. When I need information on micro-credits, I just have to email that guy, and then I have immediate information.’

I don't want to talk about market access for the poor, I want to talk about small farmers, value chains, how to value organic certifications or free certifications. (Interviewee 24, Poverty Advisor, Latin America)

This misalignment among different practices creates a self-reinforcing dynamic, similar to the one we identified for organizational embeddedness: a lack of relevance blocks further development, and then the less relevant the knowledge shared within the network, the less inclined members are to share knowledge:

It is matter of give and take, if the network does not deliver anything that advisors can use, they will not contribute to it. (Interviewee 6, Poverty Advisor, Asia)

Self-reinforcement also works the other way around: as embeddedness in practice increases and knowledge can more easily be assimilated into members' local situations, people become more inclined to contribute.

Management interventions in embeddedness in practice. Examples of interventions explicitly aimed at stimulating embeddedness in practice are scarce. The Drought network leader was very active in informing network members about relevant developments in their PA, which increased the body of knowledge relevant to members' practices. More evidence, however, suggests that management interventions aimed at increasing organizational embeddedness had a negative influence on embeddedness in practice. As noted previously, management required specific output from the networks, including strategy documents. By trying to control the content created and exchanged in the network, management pushed the boundaries of the daily practices to an abstract, organizational level and forced network members to discuss topics that they did not perceive as relevant to their local practices (despite their relevance to management). Many interviewees mentioned this agenda-setting behaviour in negative terms, noting that the topics introduced by management were not the topics the advisors perceived as relevant. To these advisors, the primary aim of their network is to discuss and solve daily problems with the help of colleagues, which is most relevant to their local practices:

And that is something we saw: advisors, they don't want to get involved in strategy, they much rather discuss daily operational work. That became very clear! (Interviewee 12, Ex-Network Leader Forestry, Asia)

Thus, management interventions with positive influences on the dynamic between knowledge sharing and organizational embeddedness (e.g. standardizing practices) might simultaneously risk decreased willingness among network members to share their knowledge, which would create a degrading dynamic between embeddedness in practice and knowledge sharing.

Relational embeddedness. *Relational embeddedness*, or the presence of strong social ties in a NOP (Granovetter, 1985), along with elements such as trust (Nahapiet and Ghoshal,

Table IV. Relational embeddedness

<i>Concept</i>	<i>Subconcepts</i>	<i>Definition</i>	<i>Exemplary quotes</i>
Relational embeddedness	Group feeling	Extent to which members feel they belong to the same group	'That is a psychological benefit, you are no longer alone, you don't have to reinvent the wheel on your own, you have a place to go to with your sorrows and your ideals, or just some questions.'
	Trust	Feelings of safety and trust in the network	'People feel it's difficult to write things down anyway because they fear that everyone will jump on them.'
	Reciprocity	Willingness of network members to help other members	'People are not always that active; they don't think: "This is someone's problem, I will help them solve it" – they don't do that.'
	Face-to-face contact	Amount and possibilities of face-to-face contacts among network members	'There have already been two meetings within ESA. In WCA they meet about once a year, but there are also sub-group meetings.'

1998), relates strongly to knowledge sharing. In Table IV, we summarize the different elements of this concept.

More than half the interviewees referred to cohesive, interpersonal relations or ties in the network as important conditions for knowledge sharing in NOPs. Through face-to-face meetings, people could get to know one another, which motivated them to make use of the networks to share their knowledge.

These social interactions and online knowledge sharing helped create a common history, together with common vocabularies, symbols, norms, and so forth. Such commonality improves network members' ability to share knowledge. Yet the results again indicate the opposite of this relationship as well: several network members reported a lack of social ties, which frustrated initially enthusiastic members from sharing their expertise because they began to feel they were giving more than they received:

There was a small core group actively contributing, but which did not receive anything in return. At a certain point you see frustration emerging and then these people started to withdraw. If there is no commitment you will see the network slowly falling apart. (Interviewee 6, Poverty Advisor, Asia)

These results imply a dynamic relationship between knowledge sharing and relational embeddedness, similar to the relationships discussed previously. Feelings of reciprocity, trust, and group identity enhance network members' motivation to share knowledge, which strengthens social ties within the network. However, when reciprocity, trust, and mutual identity are lacking, people are less inclined to share knowledge, which weakens their ties.

Management interventions in relational embeddedness. Both management and members regard strong ties as a critical condition for sharing knowledge with fellow network members, so many initiatives were designed to increase the level of relational embeddedness. For example, network leaders held a kick-off meeting during which members introduced themselves and their work experiences. Such meetings clearly seem conducive to relational embeddedness:

People are generally quite enthusiastic about belonging to the group; especially after we met in Bangkok. Then you meet each other, get to know each other. After that, it's much more fun to use an E-Group as well, for instance. (Interviewee 12, Ex-Network Leader Forestry, Asia)

Evidence of management interventions negatively influencing the relational dynamics of the network especially highlights management's actual behaviour:

People find it hard to show their weaknesses on E-Groups and there is a lack of trust that sometimes is also caused directly by the top: they have their mouths full of commitment and an organizational learning culture, but often they really don't act upon it themselves, and the Board just makes decisions on their own, etcetera. This causes trust to diminish. (Interviewee 19, Governance Advisor, Balkan)

Again, management interventions can have both a reinforcing and a degrading effect on the dynamics between relational embeddedness and knowledge sharing in a NOP.

Structural embeddedness. More than half the interviewees indicated that TDO's networks helped connect people who previously worked in isolation. This point relates to the structure of connections among people, which we refer to as *structural embeddedness*. In Table V, we outline the different elements of this concept.

Table V. Structural embeddedness

<i>Concept</i>	<i>Subconcepts</i>	<i>Definition</i>	<i>Exemplary quotes</i>
Structural embeddedness	Connectedness	Extent to which members are connected to one another	'So we said, okay – it is very important to get together, to get to know each other, because there are new people joining continuously.'
	Know who is where and knows what	Extent to which members know who knows what in the network and how to reach these people	'That is one benefit of such a network; we now know who is where and what is happening and who knows about what.'

Interviewees frequently mentioned that the networks, especially through the E-Groups, helped them get to know their colleagues working on similar topics in the region and find out who knows what and where they are located. Creating such connections appears essential for advisors to share knowledge with distant colleagues. In addition to making the knowledge sharing more efficient, this result strengthens the feeling of being part of a larger network and helps overcome the sense of being isolated:

What I see and hear is that our advisors are finally talking to each other. That might sound like a small thing, but it is a huge step forward for a group with a 40-year-old history of working on a small island on desolated parts of the world, who seldom or even never talked to one another. (Interviewee 7, Strategy Unit, Head Office)

The self-reinforcing relationship between structural embeddedness and knowledge sharing indicates that the more people can connect with one another, the more they use the NOPs to engage in knowledge sharing. This sharing in turn enables people to learn who knows what, as illustrated in the following comment:

The networks were initially aimed at exchanging about ‘who’s doing what?’ . . . and this has eventually led to insights into ‘what is the core of activities we share’. (Interviewee 10, PA Manager Governance, East-South Africa)

When people have less opportunity to connect though, they are less able to share knowledge.

Management interventions in structural embeddedness. The first and most explicit intervention by management related to structural embeddedness: by formalizing the networks, they established the structures for interaction. Also, by providing the E-Group tool and opportunities for people to meet face-to-face (e.g. travel money), TDO enabled the advisors to recognize the advantages of using the NOPs, because they could finally meet their colleagues from distant places and share their insights or discuss problems:

Yeah, those face-to-face meetings were very good. That’s essential, I think, for knowledge sharing too. (Interviewee 12, Ex-Network Leader Forestry, Asia)

The management interventions in other areas had either mixed effects or primarily negative indirect effects, but it appears that the influence of management interventions related to structural embeddedness and knowledge sharing is primarily positive.

Wheels in Motion

To apply and amend our model and illustrate its value for providing more insight into the management dilemma, we use it to analyse three typical networks about which we were able to collect substantial data during our visit to Burkina Faso and that we introduced in the introduction to the case study: Poverty, Drought and Forestry, each

active in West and Central Africa. The three networks particularly show the variety of dynamics between the various wheels in the model and how managerial interventions can influence these dynamics.

From the beginning, management was very involved in the *Poverty network*. The PA manager determined topics for discussion and gave assignments to the network. Little attention focused on social issues. During the network's annual meeting in Burkina Faso, we observed little social interaction among the members, in stark contrast with their active communication on E-Groups prior to the meeting. Network members explained that communication in the E-Groups was forced on them. Prior to a meeting, the PA manager would ask the members to upload various assignments to the E-Groups, which resulted in high levels of interaction, though only temporarily. The interaction levels strongly declined after the assignments were fulfilled or the network meetings ended. These members did not consider the Poverty network activities helpful for their local, daily practices and were not motivated to share their knowledge. When the PA Manager withdrew, the network lacked any form of organizational control, and the E-Group activities ground to an almost complete halt without any remaining stimulus for interaction.

The head office expressed disappointment with this low degree of interaction and instructed a selected group of advisors to attend a network meeting in Ouagadougou to give the network a 'social boost'. This intervention, aimed at increasing relational embeddedness, failed, because the advisors did not feel they were – or needed to be – connected. Instead, the intervention created resentment. The degrading dynamic thus appears to be a result largely of management's explicit interventions in organizational and relational embeddedness. The efforts to create a positive dynamic between knowledge sharing and organizational embeddedness resulted in a negative influence on the relationship between embeddedness in practice and knowledge sharing, and those endeavours designed to increase relational embeddedness had adverse results because embeddedness in practice was lacking.

In contrast, the activities in the *Drought network* in West and Central Africa were determined solely by the advisors, and the discussion always focused on members' shared practices. To prevent any losses in relevance, temporary subgroups often emerged, dedicated to themes that required more specific meetings or discussions. Because their participation helped them in their daily work, members were strongly motivated to share knowledge in the network. Most members enjoyed communicating with colleagues in the same field, which made them feel connected. During this network's annual meeting in Burkina Faso, the members enthusiastically welcomed one another and engaged in lively interactions, both during and after the meeting.

Management intervened in this network first by formalizing it and then by detecting issues that could be institutionalized in the formal organization, which appears to be a less intrusive intervention than that in the Poverty network. This intervention positively influenced the dynamic between knowledge sharing and organizational embeddedness, as well as the dynamic between structural embeddedness and knowledge sharing. Also, the network leader welcomed newcomers, either in person or by telephone, and informed them about the norms of the field, as well as who was who in the network. He also tried to keep network members informed about relevant events,

which increased the collective knowledge and shared identity of the network and thereby enabled members to share knowledge relevant to the various local practices of the advisors. In other words, the network leader intervened successfully in the relational embeddedness and embeddedness in practice facets. Whereas the Poverty network's wheels were halted by the inhibitory management interventions, the Drought network's wheels kept turning.

Finally, the *Forestry* network faced major difficulties getting the wheels turning at all, as if they lacked an engine. Despite the relatively small number of advisors working in the field, most of them were not familiar with the others, nor did they feel related or inclined to interact. They did not recognize how the network could support them in their daily work and considered their practices too local to discuss at a regional level. The network was 'installed' by the head office, but regional management was not actively involved and never encouraged advisors to participate. Without embedding the NOP in the practices of the advisors or supporting any knowledge sharing in the network, management could not stimulate the advisors to connect and share knowledge. Thus, the only management intervention pertained to the structural embeddedness of network members; managers introduced a formal network, but the formal network structure remained 'empty', because the targeted members did not perceive any use in sharing their knowledge. Consequently, knowledge sharing never really began.

DISCUSSION

Our study of intra-organizational networks of practice demonstrates that managing NOPs is essential for organizations' ability to integrate dispersed knowledge, which represents their main asset (Grant, 1996b; Spender, 1996). This study offers in-depth insights into the dynamic relationships between knowledge sharing as a central process within NOPs and four types of embeddedness, as well as the influence of management interventions on these relationships. One of our key findings reveals that the (knowledge) management dilemma that exists – between controlling NOPs to achieve knowledge integration and providing them sufficient space to self-organize and emerge so knowledge sharing takes place – can be disentangled into four interrelated forms of embeddedness. Management interventions thus can address either *content* or *connections*. This important insight has relevance for organizations that increasingly regard NOPs as vehicles for integrating geographically distributed knowledge (Landqvist and Teigland, 2005; Tagliaventi and Mattarelli, 2006; Vaast, 2004). Using detailed empirical data about knowledge sharing in networks in the development organization TDO, we demonstrate the effects of various management interventions on the different forms of embeddedness and knowledge sharing.

Our central contribution involves introducing and describing a model that reveals the possible and often conflicting management interventions that attempt to support knowledge sharing in and knowledge integration through NOPs. Although this model primarily provides a means to clarify and analyse the management dilemma, it also might improve understanding of how to cope with this dilemma in practice. Before elaborating on the contributions of our findings to existing literature and providing suggestions for

further research, we therefore discuss the ways management can influence processes in intra-organizational NOPs and thus clarify NOPs' potential contributions to the integration of dispersed knowledge.

Management Dilemma: Controlling Connections and Content

The proposed model distinguishes between managing *connections*, or the structure and quality of ties, and managing the *content*, or the knowledge being shared and created within the network.

Interventions aimed at controlling *connections* attempt to increase the structural and relational embeddedness of the network members. In the former case, the interventions tend to formalize networks or introduce information infrastructures, which constitute necessary conditions for members to have the opportunity to connect. Relational embeddedness interventions are necessary to create a social climate that is conducive to knowledge sharing. However, managing the social make-up of a network is risky (Currie and Kerrin, 2003; Hayes and Walsham, 2000; Thompson, 2005), as the Poverty network case shows: the connections were more or less forced, which resulted in a negative dynamic in terms of relational embeddedness.

The *content*-based interventions involve organizational embeddedness and embeddedness in practice. TDO's management confronted the dilemma of controlling the content to enhance organizational embeddedness, which might negatively influence the perceived local relevance of that content. Because TDO management was more focused on satisfying organizational needs, it largely ignored the relevance of these interventions for local practices. Thus, in terms of content, managers have to stimulate the creation and sharing of content that is relevant to the larger organization, without losing the relevance for network members' local daily practices.

Our results further indicate that the relations between knowledge sharing and different forms of embeddedness have mutual influence. Content and connections thus should be considered not separate entities but interrelated ones. A shared practice might be conducive to creating strong social ties in the network, and vice versa (Brown and Duguid, 2001; Wenger, 1998). This finding is in line with literature that stresses the conceptual difference between relational proximity (i.e. strong interpersonal ties) or cognitive proximity (i.e. shared knowledge base) and spatial proximity in a knowledge sharing context (Amin and Cohendet, 2004; Amin and Roberts, 2008; Gertler, 2003). In other words, 'where practice is common, communication can be global' (Brown and Duguid, 2001, p. 205).

Acknowledging the interrelated character of content and connections also suggests the interrelated nature of managerial interventions, such that when a manager intervenes in connections, he or she also intervenes in content, and vice versa. Again, interventions that enhance relational embeddedness may create a stronger sense of shared practices and a higher level of embeddedness in practice. Especially when these practices are geographically dispersed, stimulating awareness of common practices can be an important precondition for relational embeddedness, as illustrated by the interventions by the Drought network leader.

Implications

Prior literature notes the importance of knowledge integration (Grant, 1996a, 1996b, 2002; Spender, 1996, 1998) but does not reveal *how* management can achieve this goal. Our model provides some insights, including a more strategic view of knowledge management (Foss and Pedersen, 2004) and some ideas about *how* to cultivate, fine-tune, or nurture NOPs (Alvesson and Kärreman, 2001; Alvesson et al., 2002; Ward, 2000). The practice-based perspective often emphasizes the emergent and self-organizing character of NOPs (Alvesson et al., 2002; Brown and Duguid, 2001), but we propose a more balanced view. We also extend Thompson's (2005) contribution to a better understanding of how management can organize NOPs without killing them, which responds to recent calls for research that balances control and autonomy (Anand et al., 2007; Brown and Duguid, 2001; Cardinal et al., 2004; Robertson and Swan, 2003; Thompson, 2005) and systematically disentangles and analyses governance mechanisms from a micro-level perspective (Foss, 2007).

Whereas most NOP literature focuses on inter-organizational contexts (Faraj and Wasko, 2001) or situated learning in co-located settings (Bechky, 2003; Tagliaventi and Mattarelli, 2006), we emphasize the intra-organizational integration of globally dispersed knowledge, specifically focusing on the management of NOPs. Although our theoretical insights primarily benefit knowledge integration and NOP literature, we believe they might enhance knowledge creation and innovation literature too. Innovation represents another emergent process, whose outcomes cannot be planned beforehand, yet it is useful to manage innovation (Tidd et al., 2005). It can be difficult to manage knowledge workers, such as R&D professionals, without diminishing their (intrinsic) motivation (Alvesson and Sveningsson, 2003; Cardinal, 2001). According to the concept of organizational ambidexterity, managers must balance exploration and exploitation in innovation (Raisch and Birkinshaw, 2008). An organization that successfully balances these processes is considered ambidextrous and usually enjoys better business performance (Morgan and Berthon, 2008). The balance strongly depends on the management of different knowledge processes: top-down processes relate positively to exploitation, whereas bottom-up and horizontal knowledge inflows relate positively to exploration (Mom et al., 2007; Volberda and Lewin, 2003). Our model clearly identifies the tension between such processes (e.g. organizational embeddedness and embeddedness in practice), as well as the effect of different management interventions on balance. Jansen et al. (2008) emphasize the role of social integration in achieving ambidexterity, which clearly relates to our concept of relational embeddedness. Therefore, findings pertaining to the influence of managerial interventions on the balance between different forms of embeddedness have relevance for innovation literature.

In practice, organizations often intervene in structural embeddedness by implementing or formalizing networks. Alternatively, in the context of organizational embeddedness, organizations may try to exert control over the content generated in the network. Our proposed model reveals why these interventions are insufficient for successful knowledge integration: enhancing just structural embeddedness signifies a kind of *network determinism*, implying that building networks is sufficient to integrate geographically dispersed knowledge. Similarly, early knowledge management literature implied that

providing IT applications would lead to knowledge sharing. But a strong focus on organizational embeddedness denies the practice-based and socially embedded nature of learning, which makes networks valuable to members, and turns NOPs into teams that perform given tasks. Therefore, management should broker (or balance) the content generated in a NOP and its organizational knowledge. Our study demonstrates several ways management could balance between process and practice (Brown and Duguid, 2000a).

Limitations and Suggestions for Further Research

An important limitation of our study pertains to its generalization. Other conditions may affect knowledge sharing in NOPs but may not have emerged in our study, such as estimations of costs and needs or knowledge asymmetries (Becker, 2001; Borgatti and Cross, 2003; Brown and Duguid, 1991; Hansen, 2002). Thus, the generalizability of our findings is limited, and we have focused on what Yin (1989) refers to as analytic generalization. Additional research therefore should conduct more case studies in other types of industries to determine if the analytic generalization of these results might be strengthened. A longitudinal study also could indicate whether the dynamics of the different relationships in our model change over time, which would contribute to our understanding of the evolution of social networks (Kilduff and Tsai, 2006).

Our study indicates that managers with expertise-based authority (Alvesson and Sveningsson, 2003; Jarvenpaa and Tanriverdi, 2003) seem better able to judge (and internally market) the content that is relevant to both the organization as a whole and the network members' practices, compared with managers whose authority is based primarily on their formal position. Interventions by an acknowledged expert seem not only legitimate but valuable to the rest of the network, so they likely increase the collective knowledge of the network, which should enable members to share knowledge that is relevant to their local practices. In terms of connections, a similar observation emerges: interventions instituted by someone who is a relevant part of the network and who can be trusted and respected, especially those related to the degree of relational embeddedness (e.g. introducing newcomers to the rest of the network), seem more likely to induce positive consequences than if such interventions come from an outsider (Lave and Wenger, 1991). Managers who play the role of *primus inter pares* seem better able to intervene successfully, both in content and connections. However, it is no easy task to identify such people. Alvesson and Kärreman (2001) recognize that though managerial roles get downplayed in relation to knowledge management, visible and high-status persons, such as senior staff members, might be able to encourage knowledge sharing and relationship building in a community. Further research should attempt to develop a better understanding of the role of management (or leadership) in this respect and provide a counterweight to the overly romantic picture of self-organization.

Finally, we assumed a primarily positive relationship between knowledge sharing and relational embeddedness, though knowledge sharing literature suggests some important insights about which type of knowledge is more likely to be shared in which types of network constellations. Hargadon and Sutton (1997) find that in sparse networks full of

brokerage opportunities, bridges to dissimilar parties likely enable access to valuable and new knowledge. Reagans and McEvily (2003) also indicate that densely connected networks without brokerage opportunities and redundant ties lead to the free flow of knowledge. Hansen (1999) suggests that tacit knowledge is best shared between units connected by strong ties, whereas explicit, codified knowledge is best shared through weak ties. In relation to our model, we recognize the need for a more fine-grained conceptualization of social ties and knowledge sharing. The relationship between relational embeddedness and knowledge sharing might be understood in greater depth if researchers were to distinguish between different ties and different types of knowledge. This effort could shed more light on the possible consequences of management interventions pertaining to this form of embeddedness.

CONCLUSION

Intra-organizational networks of practice require some form of management control, because the members are dispersed, which makes social learning less likely to take place than in a COP, whose members typically are co-located. Because of the inherently emergent and practice-based nature of NOPs, this requirement creates a management dilemma. By addressing this dilemma, this study contributes to knowledge management theory and provides empirical evidence of how organizations might balance control and autonomy when managing their NOPs. Our data indicate that both network members and the knowledge they share are embedded in particular environments, which influences knowledge sharing in NOPs. Management thus can control both content and connections. The embeddedness of knowledge in the local practices of the network members appears important for actual knowledge integration by NOPs, though this point is often ignored. Finally, because in a global world, people increasingly work in different locations, at flexible hours, and in different time zones, guarding the various forms of embeddedness in relation to knowledge sharing represents a crucial management challenge to keep the wheels turning in intra-organizational NOPs.

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APPENDIX: COLLECTED DATA PER NETWORK

<i>Name of network</i>	<i>Collected data</i>	<i>Interviews</i>	<i>References to network in interview with</i>	<i>Number of posted messages (members)</i>
West-central Africa: Governance	Interviews, survey	Advisor	PA Manager; Local Manager;	392 (100)
West-central Africa: Poverty	Interviews, survey, observations, formal documents, log files	PA Manager	2 Advisors; Country Director Regional Director; Local Manager; Advisor	283 (36)
West-central Africa: Forestry	Interviews, survey, observations; log files	Network Leader	Local Manager/Network Leader	120 (18)
West-central Africa: Gender	Interviews, survey	Network Leader; Country Director	Strategy Unit	50 (45)
West-central Africa: Drought	Interviews, survey, observations; log files	2 Advisors	Regional Director; Local Manager; Country Director; Strategy Unit	214 (70)
East-South Africa: Governance	Interviews, survey	Advisor		301 (85)
East-South Africa: Poverty	Interviews, survey; formal documents; log files			204 (64)
East-South Africa: Tourism	Survey		Regional Director	89 (37)
East-South Africa: HIV/AIDS	Interviews, survey			66 (33)
East-South Africa: DRHA	Survey	Network Leader		73 (43)
Asia: Governance	Survey; formal documents			210 (58)
Asia: Poverty	Interviews, survey; formal documents; log files			123 (55)
Asia: Tourism	Interviews, survey; formal documents; log files		Regional Director	173 (63)
Asia: Forestry	Interviews, survey; formal documents	Former Network Leader Forestry/ Local Manager; Advisor	Local Manager/Network Leader	540 (39)
Asia: Biogas	Interviews, survey; formal documents			1 (3)
Asia: Water	Survey; formal documents			24 (14)
Latin America: Governance	Survey			75 (10)
Latin America: Poverty	Survey	Network Leader; 2 Advisors	Regional Director; Local Manager/Network Leader	325 (85)
Latin America: Forestry	Survey; formal documents			674 (51)
Latin America: Water	Survey			250 (35)
Balkan: Governance	Survey			No E-Group use
Balkan: Forestry	Interviews, survey; formal documents	Local Manager/Network Leader		No E-Group use

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