

An Empirical Classification of Knowledge Sharing Networks in Practice

Robert M. VERBURG, J. H. Erik ANDRIESSEN

Delft University of Technology, Jaffalaan 5, 2628 BX Delft, The Netherlands
Tel: +31 15 278 7234, Fax: +31 15 278 2950, Email: r.m.verburg@tudelft.nl; Erika@tudelft.nl

Abstract: Many knowledge intensive organizations rely on knowledge sharing networks. Such networks, often called ‘communities of practice’ are found in many organizations but their forms and functions appear to be quite diverse. In this article we determine and discuss a number of basic types of knowledge networks. A literature analysis and a study of 38 networks in large organizations yielded two dimensions of networks, institutionalization and proximity. On the basis of these dimensions four basic types of knowledge networks were discerned: strategic networks, informal networks, question & answer networks, and on-line strategic networks. The recognition of this variety of knowledge networks highlights the different ways in which knowledge sharing and creating can be organized and shows that these different forms of organizing require different technological and organizational support

Keywords: Communities of practice; knowledge sharing and transfer; new organizational forms

1. Introduction – Knowledge Processes, Innovation and Networks

Current work environments are characterized by knowledgeable, productive, and flexible employees, who contribute significantly to firm performance through innovation [1]. Communication possibilities have improved high quality collaboration between people across traditional boundaries. The role of learning of both of individuals and groups within these structural organizational realities has become a major challenge for companies. Employee development in a broad sense is crucial for companies in rapidly changing contexts. Increasing expertise within the firm is important for the organization. Also, most employees value opportunities for some form of development at work, increasing the attractiveness of employers able to offer such opportunities.

Learning is equally important on a group level, for example where external collaborations between firms are becoming increasingly important. The concept of knowledge networks has attracted much attention over the years. The concept originates from the realm of knowledge management but as more and more companies are relying on their knowledge base, knowledge networks have become a very visible reality in many organizations. Knowledge intensive organizations are increasingly dependent on transferring and sharing knowledge, experiences and insights among employees. Two ways to deal with this issue are found in organizations, codification and interaction. The first approach leans heavily on knowledge systems and procedures to store and exchange documents. The second approach relies more on interpersonal exchange of knowledge and highlights the role of knowledge intermediaries and knowledge sharing networks. Both approaches can be considered elements in a knowledge-based perspective on firms which highlights the organizational routines and experiences on which individuals draw to perform optimally and use the creative potential of human action [2].

Emergent social networks have been studied by social scientists for a long time. However, organization theorists have only recently recognized their role as vital conduits for knowledge flows [3]. Knowledge sharing networks can be found within and across many organizations nowadays and are often called ‘communities of practice’. The forms, functions, and terminology of these knowledge-sharing networks can differ quite dramatically. The problem with networks and interpersonal knowledge sharing is that the transfer of what is learned remains limited to the few people involved. Elsewhere in the network people cannot benefit from this knowledge, since the local knowledge is not ‘translated’ into new organizational procedures and ways of working. When shared knowledge is accepted by the network, it becomes organizational knowledge, which is then available to be embedded in organizational practices and to be distributed again to individuals or groups. But there has to be a special agency to ensure that the experience becomes embedded in the network [4]. These ideas suggest that knowledge networks may have a double function, that of facilitating the interaction and learning of individual members, and that of bridging the gap between experience-sharing individuals and the network. And indeed some organizations have communities that ‘translate’ their member’s knowledge into overviews of best practices

2. Objectives – the Classification of Knowledge Networks

The purpose of this article is to clarify this conceptual jungle by systematically comparing the various concepts and phenomena that are encountered in this field. We will propose a classification model of knowledge networks, based on the building blocks offered in the literature, and we will identify several basic types of knowledge networks using an empirical analysis of such networks in practice. The existence of identifiable types of knowledge networks has implications for both theory and practice, as unjustifiable theoretical generalizations concerning interaction in or facilitation of knowledge networks may be avoided by specifying different kinds of organizational knowledge networks. Conclusions about how to organize and facilitate knowledge networks have often been too general and a typology of knowledge networks will allow for a better understanding of conditions for success and failure in different contexts.

2.1 In search of knowledge networks

Knowledge networks can be found within one corporation, spanning many business units, but they can also be inter-organizational, comprising members of different companies. For example, such networks could involve researchers working on a similar topic in different research organizations. These networks are clearly different from the more or less co-located groups of colleagues as described by [5,6,7].

Should one then conclude that we are talking about two completely different phenomena? On the one hand, local, informal groups of both experienced and inexperienced traditional workers, and on the other hand often globally distributed groups of expert knowledge professionals? Despite the differences, these groups also have much in common, which justifies bringing them together. Their commonality is to be found in the fact that they are all emergent, autonomous and self-organizing networks, whose primary purpose involves knowledge sharing, knowledge creation, and learning. The traditional local communities of practice have come to be considered as a subset of a general type of learning networks [8, 9,10]. Learning in this sense is an interaction process, where knowledge is socially constructed and situated. Of course, people need to build upon mutual understanding, creatively handling ‘cognitive distance’ [10] before they can adequately share or jointly develop new knowledge. However, the growth of a common identity and work practice is not necessarily the central function of such communities.

Even within self-organizing groups that are primarily focused on learning, several types can be distinguished either derived from a typology or from differentiating dimensions. Some scholars have distinguished two or three completely different types of knowledge sharing networks, while others have identified dimensions along which knowledge networks can differ (see next section). The objective of this paper is to combine both approaches, in other words to derive basic types from a dimensional analysis of a large set of knowledge networks. We identify dimensions and basic types by analyzing the literature and by assessing the characteristics of a number of knowledge networks. This approach consists of the following steps. The first step is to identify different characteristics of knowledge sharing networks on the basis of a literature review of major publications on such networks. The list of characteristics of different networks is then used to score a number of different networks. This is done by an expert rating, i.e. we ask a number of scholars who have published research on knowledge sharing networks to score their networks by means of our list of identified characteristics. Before the expert rating a pilot is done in order to test for convergent validity and to eliminate possible ambiguities in the description of the characteristics. The final step involves the analysis of the expert rating. This includes the extraction of underlying dimensions and the statistical identification of basic network types.

In the next section we will describe the identification of characteristics of knowledge networks from the literature. Then we will provide more details on our methodology of the empirical studies and present the results of our analysis.

2.2 Identifying key characteristics of knowledge sharing networks

The notion of 'knowledge networks' appears to cover a variety of organization related social structures that have a common raison d'être in knowledge sharing. The concept refers to rather loosely coupled networks of employees who cross intra- or inter- organizational boundaries and interact to learn from each other by exchanging information and experiences. According to the literature, however, these social structures may differ in the objectives of their knowledge sharing, in their structure, their composition and distribution, and in the way they interact and communicate. The key characteristics of knowledge networks that were identified by different authors are presented below.

- Purpose: Having a common mission versus only exchanging information, or also: having an organizational orientation, i.e. developing best practices or even innovative solutions, versus an individual orientation, i.e. exchanging information for solving personal problems and learning [11]
- Contract value: degree to which the community has to deliver concrete results [12]
- Formalization: having more or less formal meetings and an appointed coordinator [12]; formally set-up by management and clearly visible to management [13]
- Composition: only experts or both experts and newcomers [12].
- Boundary: whether the community is closed or open for new members [12,8], having fixed or shifting relationships and membership [14]
- Reciprocity (connectivity): degree to which members interact mutually and know each other [8,14]
- Identity: Feelings of cohesion, trust and belongingness [14,15]
- Size of the community [8]
- Intra- or inter-organizational [8]
- Geographical dispersion [16,17]
- Mode of interaction: face to face and/or via ICT [16,17]

The list of characteristics presented in table 1 has been used to characterize a set of knowledge networks that have been studied by colleagues in several countries (see below for a description of the method). The relations between the characterizations of the different

networks will then be used as the basis for discerning basic dimensions and types of knowledge networks.

3. Methodology - Empirical Analysis of 38 European Networks

For the purpose of this study a total of 38 networks from different countries were rated in terms of the key aspects as presented in table 1. The 38 networks under study were selected on the basis of their descriptions in the current literature. In the past few years, many in depth studies of knowledge networks, both intra-company and inter-company were published and presented at conferences by a variety of authors [17,18,19,20,21]. The authors were approached and asked to apply our scoring method to their networks reported in the literature. All authors agreed to participate, resulting in the sample of 38 networks (eleven from Italy, eleven from Finland, ten from the Netherlands, five from Norway and one from France).

Can this group of knowledge networks be considered as a representative sample? No, they cannot, simply because the population is unknown. This study aims to develop more clarity about the population and about possible sub-populations. The main criterion for selection in the various studies was to find groups of which the primary object was the exchange of knowledge. Another criterion for including cases in this study was variety. In other words, our aim was to collect diverse knowledge networks from different organizations in terms of purpose, size and other characteristics.

4. Results

The 12 variables (characteristics of networks) and 38 knowledge networks were analyzed using a special form of factor analysis. Categorical principal components analysis (CATPCA) was used to accommodate variables of mixed measurement levels. The results are presented in table 1.

Table 1: Results of the Categorical principal components analysis (CATPCA) factor analysis with variable principal normalization.

	Dimension 1	Dimension 2
Organizational. orientation	,796	-,127
Contract value	,750	-,208
Formalization	,685	-,110
Origin	-,331	-,290
Composition	,637	,133
Boundaries	,729	-,300
Reciprocity	-,014	,737
Identity	,422	,347
Size	-,654	-,380
Intra-inter focus	-,256	,678
Mediated interaction	-,283	-,711
Dispersion	-,049	,834

Results show that certain key aspects are highly related, resulting in the identification of two main clusters of characteristics that can be considered as two basic dimensions for differentiating knowledge networks. The identification of clusters does not imply that all aspects in a cluster are basically identical. Characteristics are placed in the same cluster because they tended to be found together in the networks studied.

The first dimension consists of the following five characteristics: organizational orientation, contract value, formalization, boundaries, and composition (Cronbach's $\alpha = .76$). Knowledge networks that are focused on the development of organizational

knowledge also tend to have strong accessibility rules, institutionalized coordination and other formalized rules. At the other pole of the dimension one finds a focus on individual learning and problem solving, on knowledge networks with relatively low formalization that are open for new and even inexperienced members. We labelled this dimension 'institutionalization'.

The second dimension represents four characteristics: reciprocity, focus, dispersion, and mediated interaction. These elements refer to the degree of interaction between members, the inter- or intra-organizational focus of the network, the geographical dispersion of its members, and the degree of mediated versus face-to-face communication (Cronbach's $\alpha = .60$). We labelled this dimension 'proximity'. The first component, reciprocity, has clear relations with social network indicators such as density. High on this dimension one finds geographically and organizationally close knowledge networks with high levels of interaction, while knowledge networks low on this dimension are strongly dispersed and do not have high levels of internal interaction.

4.1 Identifying basic types of knowledge sharing networks

The two dimensions are related to important key characteristics of organizational units. Formalization and institutionalization are major control mechanisms for organizational units [22]. It is interesting to note that knowledge networks can strongly differ on these basic mechanisms. The fact that many of the networks are informal in nature is in line with the original theories about communities of practice [5]. However, some knowledge sharing networks are institutionalized to quite a degree, although not to the degree of formalization as in project teams.

The second dimension is also quite central to organizational functioning. Proximity enables groups to interact and communicate frequently, which forms an important condition for groups to develop trust and to cooperate well. This dimension also seems to be related to the distinction between weakly tied and strongly tied networks. Interestingly, this dimension is related to the use of ICT media for communication in the network. A high score on the proximity dimension implies face to face communication as the primary mode of interaction within the network.

It is now possible to see how the 38 knowledge networks are distributed across the two extracted dimensions. Figure 1 consists of a scatter plot with the institutionalization dimension on the x-axis and the proximity dimension on the y-axis. The scores of the networks on the five items of the institutionalization dimension were computed. This dimension has a minimum score of 5 and a maximum score of 15. Scores on the four items of the proximity dimension were computed accordingly leading to a minimum score of 4 and a maximum score of 12. A detailed analysis suggests that the networks cluster in four types as shown in figure 1.

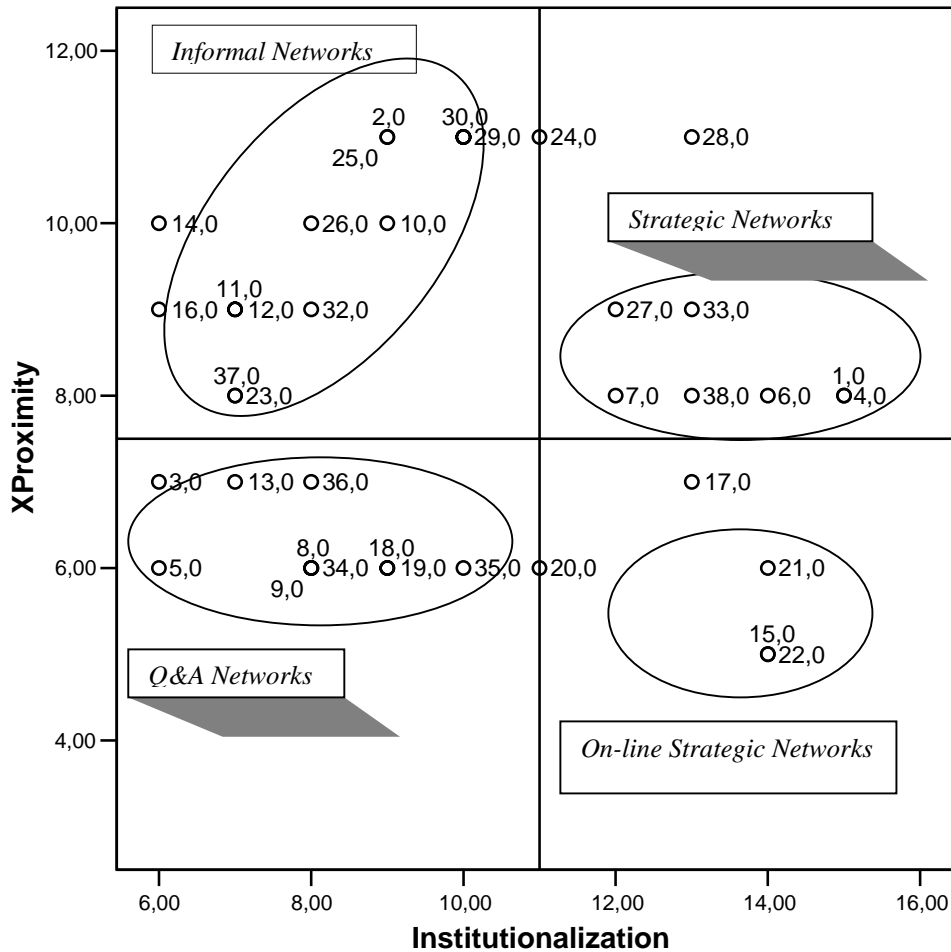


FIGURE 1: A Classification of Knowledge Networks in a two dimensional space

The different types of networks can be described in the following way:

1. Informal Networks: groups of employees with a common area of interest, often closely related to their work (practice), having substantial interaction, a common history and 'culture' involving shared concepts, ideas, stories etc. The main purpose of (people in) these networks is to learn from each other; the transfer of this shared knowledge to the company is of less importance. This type of knowledge networks is generally not very formalized, although some may receive support when they have proven their value. These communities grow spontaneously, are either small or have a small core and a larger circle of peripheral members. According to our studies, a very active coordinator or core group and adequate ICT support are generally required to ensure success of such networks.
2. Question and Answer (Q&A) Networks: knowledge networks with low to intermediate proximity and low levels of institutionalization. These networks consist of employees who exchange, over a company intranet, questions ("Who can help me with") and answers concerning the solution of certain practical problems. Although the size of such networks may be quite large (sometimes many hundreds of members), they still display some form of group identity, based on commonality in function and organization. Q&A Networks have limited purposes and seem to thrive without many success conditions, except minimal commitment of those involved as members and good email connections.
3. Strategic Networks: institutionalized groups of experts whose activities are focused on organizational learning. These groups are highly supported with resources and have a strong 'contract value'. In other words, participants are expected, implicitly or

explicitly, to perform for the company, to develop best practices or even innovative solutions. These networks generally consist of a limited number of experts, without a periphery of 'lurkers', since membership is generally not open. The food company network described above is a good example of this type of network. In some cases, these groups may cross the border between knowledge networks (learning oriented groups) and workgroups or task forces (product oriented groups). Like most knowledge networks found in large companies, members of the strategic networks tend to be organizationally and geographically widely distributed. Some of these networks, however, do much interaction in face-to-face meetings. Our studies suggest that strategic networks require intensive preparation, member selection, support, and coordination to be effective.

4. On-line Strategic Networks. A small group of the networks studied here is relatively highly institutionalized yet shows low levels of proximity among its members. These networks have similar institutionalization as the strategic networks described above but low proximity, particularly because of their exclusive communication via electronic means (mainly internet or Intranets). This setting makes interaction, coordination, and cohesion forming within the network quite difficult. Such networks seem to be rare and we have labelled these as 'on-line strategic networks'.

5. Business Benefits and Conclusions

There are a great variety of social structures that can be discussed under the heading of knowledge sharing networks. Some try to take the differences into account by distinguishing two or three (sub) types of networks; however, these typologies are not similar and are not usually based on sound theoretical arguments or comparative empirical data. Many new terms have been invented, such as community of interest, community of commitment, interest group, network of practice, knowledge network, knowledge community, internal community, expanded community, formal network and epistemic community. The great variety in terminology has led to the current situation in which different names are applied to the same phenomenon or that the same label refers to different phenomena.

The recognition of this variety of knowledge network points firstly at the different ways in which knowledge sharing and learning can be organized. Secondly, it has consequences both for technological and organizational support of such networks. The 'availability' of diverse types of networks may promote the realization that before starting knowledge communities, organizations should first consider their objectives and situational constraints. Differences in objectives, desired connectivity and dispersion then have implications for the organizational support that is required. Some networks need extensive top down facilitation, while others are only successful if they grow spontaneously from the bottom up and are left alone by management. As far as technical support is concerned, some communities can thrive well with limited communication tools, others need extensive information services and groupware to function optimally. The identification of the four main types will further enable companies and organizations to make an informed decision about what kind of network will suit their specific purposes.

References

- [1] T. Malone, *The Future of Work*. Harvard (Mas.):Harvard Business School Press, 2004.
- [2] H. Tsoukas, H, Introduction to the special issue on Knowledge-based Perspectives on Organizations: Situated Knowledge, Novelty, and Communities of Practice. *Management Learning* 33(4), 2002, pp. 419-426.
- [3] M.M. Appleyard, How does Knowledge Flow? Interfirm Patterns in the Semiconductor Industry. *Strategic Management Journal* 17, 1996, pp. 137-154.

- [4] C. Argyris & D. Schön, D.A., *Organizational Learning II: Theory, Method, and Practice*, Reading (Mass.): Addison-Wesley, 1996
- [5] J. Lave & E. Wenger, *Situated Learning. Legitimate Peripheral Participation*. Cambridge: University Press, 1991
- [6] J. Brown & P. Duguid, 'Organizational Learning and Communities-of-Practice. Towards a Unified View of Working, Learning, and Innovation'. *Organization Science* 2(1), 1991, pp. 40-57
- [7] E. Wenger, R. McDermott & W. Snyder, *Cultivating Communities of Practice*, Harvard (Mas.): Harvard Business School Press, 2002.
- [8] J. Brown & P. Duguid, 'Knowledge and Organization; A Social-practice Perspective'. *Organization Science* 12(2). 2001, pp. 198-213.
- [9] M. Wasko, S. Faray & R. Teigland, *Collective Action and Knowledge Contribution in Electronic Networks of Practice*, *Journal of the Association for Information Systems (JAIS)* 5(11), 2004, pp. 12-36
- [10] I. Bogenrieder & B. Noteboom, 'Learning groups: What types are there? A theoretical analysis and an empirical study in a consultancy firm'. *Organization Studies* 25 (2), 2004, pp. 287-313
- [11] P. Gongla & C. Rizzuto, 'Evolving communities of practice: IBM Global Service experience'. *IBM Systems Journal*, 40(4), 2001, pp. 842-862.
- [12] C. Collison, 'Connecting the new organization. How BP Amoco encourages post-merger collaboration'. *Knowledge Management Review* 7(2), 1999, pp. 12-15.
- [13] J. Botkin, *Smart business: how knowledge communities can revolutionize your company*. New York: The Free Press, 1999.
- [14] V. Allee, *Knowledge Networks and Communities of Practice*. *OD Practitioner*, 32, 4. Retrieved from <http://www.odnetwork.org/odponline/vol32n4/knowledgenets.html>, 2000.
- [15] R. McDermott, *Learning across Teams: The Role of Communities of Practice in Team Organizations*. *Knowledge Management Review*, 7(3), 1999, pp. 15-27..
- [16] C. Kimble, P. Hildreth & P. Wright, P, 'Communities of Practice: Going Virtual' in *Knowledge Management and Business Model Innovation*. Yogesh Malhotra (ed),. Hersey, : Idea Group Publishing, 2000, pp. 220-234
- [17] I. Ruuska & M. Vartiainen, 'Communities and other social structures for knowledge sharing - A case study in an Internet consultancy company' in *Communities and Technologies*. Marleen Huysman, Etienne Wenger, and Volker Wulf (eds). Dordrecht: Kluwer Academic Publishers, 2003, pp. 578-603.
- [18] J. Andriessen, M. Huis in 't Veld & M. Soekijad, *Communities of Practice for Knowledge Sharing* in *How to manage experience sharing: From organizational surprises to organizational knowledge* J. H. Erik Andriessen and Babette Fahlbruch (eds),. Oxford, UK: Elsevier, 2004, pp. 173-194
- [19] M. Corso & A. Giacobbe, *Organizing for continuous innovation: the communities of practice approach*. Paper for CINET Conference, Brighton, UK, 2005
- [20] E. Hustad & R. Teigland, *Taking a differentiated view of intra-organizational distributed networks of Practice*. Paper presented at the *Communities of Technologies Conference*, Milan, Italy, 2005.
- [21] G. Sardone, *Supporting Business Community Management through Social Network Analysis*. Dissertation. Milan, Italy: Politecnico di Milano, 2006.
- [22] H. Mintzberg, *Structure in fives: Designing effective organizations*. Englewood Cliffs (NJ): Prentice-Hall, 1983.