IS - 2006-01
Delft Innovation System Papers

Knowledge Communities in fives

J.H. Erik Andriessen [1]

Research Programme Innovation Systems

Delft University of Technology
Faculty of Technology, Policy and Management
Jaffalaan 5
2628 BX Delft
The Netherlands
Tel.: +31(0)15 27 81300
Fax: +31(0)15 27 83177

Please send questions and / or remarks to t.c.wenneker@tudelft.nl

1 Delft University of Technology

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J.H.Erik Andriessen
Delft University of Technology

Abstract.

Many modern knowledge intensive organisations rely on knowledge sharing communities, often called ‘communities of practice. These communities can be found in many organisations, but their forms and functions appear to be quite diverse. This implies that questions concerning the *functioning of communities, (*how do they work) and questions concerning *success conditions* (how to organize and facilitate them) cannot be answered in a general way. The purpose of this article is to develop the theory in this area by discovering basic types of knowledge communities, underlying the diversity of knowledge sharing groups. Through an analysis of the literature and of a series of communities in large organisations, three basic dimensions, i.e. institutionalisation, connectivity and virtuality, and five basic types of knowledge communities are identified, i.e. strategic communities, informal communities, knowledge networks, interest groups and Delphi groups.

Keywords: communities of practice, knowledge management, social learning, knowledge sharing, networks

The discussion concerning social structures for knowledge sharing takes place in two widely divergent frameworks, i.e. social learning theory and knowledge management theory (see below). Within the two frameworks the concept of knowledge sharing community has quite different connotations and different aspects of this phenomenon appear to be central. The framework of *social learning theory* focuses particularly on knowledge sharing and apprenticeship in informal groups of more or less co-located professionals (Lave and Wenger, 1991). The idea of communities as breeding grounds for sharing experiences and solving problems has, however, found an open ear and eye in modern companies, looking for systematic ways of strengthening its most important asset, the knowledge embedded in their employees. Knowledge managers that previously focused on the development of digital information systems to capture and distribute valuable knowledge, discovered the value of ‘communities of practice’.

The need for knowledge sharing in organisations resulted in the growth of a wide variety of channels and forms, many of which differ quite substantially from the original concept of ‘community of practice’ by Lave and Wenger (1991). This has resulted in a confusing situation. Some authors do not differentiate between various forms and discuss Communities of Practice as if they are all basically the same. Moreover, they provide principles and guidelines as if success conditions for all communities are more or less identical. Other scholars try to take account of the differences by distinguishing between two or three (sub) types, but their typologies are not identical. Since everyone prefers to have his or her own concepts, many new terms are invented, such as community of interest, community of

commitment, interest group, network, network of practice, knowledge network, knowledge community, internal community, expanded community, formal network and epistemic community. The final effect is that different names are applied to the same phenomenon and that the same name refers to different phenomena. The theory about knowledge sharing in organisational communities is in need of an overview of the basic types of structures, their processes and success conditions.

In this article the processes and structures, aspects and dimensions in which these communities differ are examined and the variety of communities is identified. This is done by studying the literature and by analysing a series of real life communities. The objective is to develop a classification model and to identify a small number of basic types. In that way unjustifiable generalizations concerning learning and interaction in, or cooperation and facilitation of communities may be avoided.

The discussion is limited to communities of employees and workers. This may include inter-organisational communities and of course communities of governmental or university employees. But Internet communities, open networks like Yahoo groups, customer service sites, citizen action groups or neighbourhood communities are outside the scope of this discussion. These groups are all dealing with knowledge exchange, but the context is not organisation oriented and the dynamics in these communities may therefore have quite different characteristics.

Two Perspectives

Social learning theory

About fifteen years ago the idea of Communities of Practice was developed in the framework of social learning theory applied to organisational apprenticeship (Lave and Wenger 1991). Studies of what were called ‘communities’ of tailors and meat cutters, of midwifes and copier machine maintenance men, were undertaken (Lave and Wenger 1991; Orr 1990; Brown and Duguid 1991). They confirmed the principle that professional learning is ‘situated learning’, where groups of co-located workers are the framework both for transferring knowledge, particularly from experienced workers to apprentices, and for developing new solutions and innovative ideas. The rationale behind the concept of situational learning is the fact that knowledge is different from information. Knowledge is information that is experienced and interpreted by a person, it makes sense to that person and is related to an actual situation. Knowledge is often very implicit, not consciously articulated, i.e. it is tacit.

Like Lave and Wenger (1991), Brown and Duguid (1991) also emphasized the situated aspect of social learning in co-located groups. Their focus however was the contrast between formal and informal organizing. Formal descriptions of work (e.g., 'office procedures') and of learning courses are often abstracted from actual practice. As a result education, training and technology design tend to focus on abstract representations of work processes, to the damage actual practice. Management often assumes that complex tasks can be successfully mapped onto a set of simple Tayloristic, formalized steps that can be followed without need of significant understanding or insight (and thus without need of significant investment in training or skilled technicians). By relying on formal descriptions, managers develop a conceptual view that does not take into account the importance of non-formal practices. In their case studies Brown and Duguid discovered how the burden of linking formal descriptions to actual practice rests with communities of employees. By bridging this gap they protect the organisation from its own short-sightedness. If the employees would adhere to the formal approach, their company’s services would be in chaos. The employees therefore develop sophisticated non-formal practices.

Summing up, central in all these ideas is the concept of 'practices', around which groups share, acquire, and create their knowledge. It is knowledge related to a common professional discipline, a skill or a topic. The focus in this perspective is on more or less collocated groups of professionals who develop a shared repertoire and resources such as routines, vocabulary, stories, symbols, artefacts, and heroes that embody the accumulated knowledge of that group. This shared repertoire serves as a foundation for learning. By acquiring this shared knowledge, newcomers move from the periphery to the centre of the community.

Knowledge management theory

Meanwhile management in knowledge intensive companies was looking for ways in which experiences of their employees could be shared, valuable skills could be kept in the company when employees leave, and the creation of new solutions and innovative concepts could be stimulated. In the eighties and the beginning of the nineties all knowledge processes, i.e. acquiring, developing, storing, exchanging and applying knowledge, was regarded to benefit enormously from investing millions of dollars in 'knowledge technologies'. Procedures to elicit knowledge from employees, to convert it into a systematized form and to store it in company wide repositories were, and often still are, very popular.

This codification approach (Hansen et al., 1999) has seen many failures (Huysman and Wit, 2002), an important reason being that people find it difficult to explicitly describe their experiences and the insights they have developedfound. Moreover, there is psychological resistance against providing and using knowledge that is separated from its owner i.e. that is made *impersonal*. Exchanging knowledge with others may provide status and is trustworthy for the receiver. Putting knowledge in a system is cumbersome, removes it from its context and rarely provides personal rewards.

Companies therefore developed new strategies with a focus on people meeting each other, on interpersonal knowledge sharing, on master-apprenticeship relations, on knowledge intermediaries (‘knowledge brokers’) and on knowledge networks and communities. These networks may consist of people from different and geographically distributed units of the organisation. The concept of ‘communities of practice’ thus became related to groups of professionals from different organisational units who have a common interest in certain work related topics and share there knowledge on a regular basis.

Certain scholars and consultants in this area defined these communities of practice in a way that also included the above mentioned co-located groups of professionals. Wenger (2000) defines CoPs as follows: *“The term ‘community of practice has been used for over a decade to describe social communities or groups that have cultural practices reflecting their collective learning”*. Botkin (1999, 241) defines CoPs as *"highly informal groups of people that develop a shared way of working together to accomplish some activity. Usually such communities include people with varying roles and experience”*.

However, other definitions accounted for the fact that the various types of communities growing up in the era of knowledge management, were most often organisationally and geographically dispersed, depended on ‘mediated communication’, i.e. ICT tools, to interact, and had sometimes ample management backing. Gongla and Rizzuto (2001, 843), discussing IBM’s “knowledge networks,” referred to these communities as “*institutionalized, informal networks of professionals managing domains of knowledge”*. They define the common characteristics of these knowledge networks as follows:

- They are global in scope, connecting practitioners worldwide and fostering a sense of community.

- They are responsible for a domain of knowledge. This responsibility includes gathering, evaluating, structuring, and disseminating knowledge that is shared among community peers and across customer projects and seeing to its evolution.
- They adopt a small set of common roles for managing knowledge
- They provide opportunities for sharing tacit knowledge among community members
- They use the common enterprise-wide Lotus Notes and Domino application
- They are sponsored by a business unit and fostered where the business sees a need for managing knowledge for its core competencies or to meet customer or market demands.
- They are neither organisation units nor teams.

This type of knowledge sharing group is clearly different from the more or less co-located groups of old-timer and new-coming practitioners as described by Lave and Wenger (1991) or Brown and Duguid (1991).

In search of knowledge communities

Should one conclude from the discussion above that we are talking about two completely different phenomena? On the one hand local, informal groups of experienced but traditional workers, and on the other hand, globally distributed groups of expert knowledge professionals? This would be a wrong conclusion for two reasons. Firstly in both cases the groups are supposed to focus on learning in an informal context of knowledge-eager employees. And secondly, because in actual practice one can find types of knowledge communities, that appear to combine characteristics of both (see below). Some scholars in this field have distinguished two or three types of communities, but the categorizations of these scholars are not similar. Others have identified aspects in which communities can differ, implying that those aspects can be used to differentiate between certain types of communities.

In this article I will try to answer the question whether there are perhaps some basic forms, let us say basic types, of knowledge sharing communities. To find these basic types I have tried to discover whether a small set of e.g. two or three basic dimensions can be found that underlie the major aspects in which knowledge sharing communities appear to differ. When such basic dimensions can be found, concrete examples of communities can then be plotted in the (two or three dimensional) space that is defined by these dimensions. Inspection of the way these communities are clustered can then result in the identification of certain basic types of communities.

The identification of dimensions and basic types has been done by analysing the literature and by assessing the characteristics of a number of communities. This approach consisted of the following steps:

- *Step 1. Identifying key characteristics.* Through a study of major publications on communities, the various aspects are identified that are used by these scholars to describe and differentiate between communities (See following section).
- *Step 2. Scoring knowledge communities.* Thirty four communities in nineteen organisations in five countries are studied. These communities are characterised (‘scored’) according to the method developed in step 1.
- *Step 3. Extracting basic dimensions.* The relationships between these ‘scores’ are analysed to discover underlying basic dimensions that differentiate the communities studied.
- *Step 4. Identifying basic types.* The thirty four communities are plotted in the dimensional space. The result are analysed to discover basic types of communities.

Identifying key characteristics

In this section major publications concerning knowledge sharing communities are examined, to discover which aspects of communities are considered important. All authors have come to their views on the basis of practical experiences with knowledge communities. The phenomenon of organisational knowledge communities and particularly the systematic study of them is quite young and most publications are practitioner oriented. Major publications will be presented in chronological order.

Wenger, who since 1990 had been leading in the field, does not give much attention to differences between various types of knowledge communities (see e.g. Wenger, 1998). However, he stresses that communities of practice consist of members who are informally bound by what they do together – from engaging in lunchtime discussions to solving difficult problems – and by what they have learned through their mutual engagement in these activities. Their basic purpose is to develop members' capabilities. A community of practice is thus different from a community of interest (or informal networks), which does not have *shared practice and interactions*, but serves only to exchange (business) information.

McDermott (1999b) takes a comparable approach. He uses the *degree of connection and identity* among members as the key dimension to distinguish between three types of networks:

- *user groups*, i.e. individuals who are all interested in certain types of information, but with hardly any interaction and a weak identity,
- *networks*, groups of people who share a common interest, exchange questions and solutions, but have limited sense of common identity and rarely meet as a network
- *communities of practice*, groups who share a common identity, history, and purpose, which is often directed at developing best practices.

Collison (1999) describes the two types of communities distinguished within the BP-Amoco Company, i.e. Communities of Practice and Communities of Commitment. The difference between the two is explained in terms of *contract value*, i.e. the degree to which the community has to deliver concrete results. CoPs have limited contract value, while Communities of Commitment have high contract value. According to Collison communities of practice are sometimes given resources by the business, often to the extent of funding a network coordinator, but do not collectively contract to deliver value to the organisation. There is often no defined membership, and no fixed program of meetings, the network preferring to meet continuously but virtually. Communities of Commitment resemble project teams, because they are sponsored and resourced by the company, often have performance contracts or expectations, had defined membership, and a formal program of meetings with objectives and deliverables. An example was the maintenance managers' network; a network of refinery managers committed to reducing the maintenance cost to a target level fixed by the organisation. From these descriptions it becomes clear that the two types of communities not only differ in contract value but also in aspects of *formalization* such as defined *composition (*only experts or experts plus newcomers) and formal agenda's.

The aspect of formalization is also taken up by Botkin (1999), stressing the aspect of visibility. He distinguishes between 'communities of practice' and 'knowledge communities'. A major characteristic of communities of practice is their informal structure, spontaneous origin, and therefore their (in)*visibility*. Knowledge communities are "*purposely formed - some like those at AT&T even have formal membership lists - and their purpose is to shape future circumstances. They are highly visible to every businessperson in the organisation"*.

Both types of communities contain members with a common passion to create, share, and use new knowledge; in both cases participation gives a sense of identity. CoPs however are informal groups, with open *boundary*, while the knowledge communities have sometimes closed boundary.

Allee (2000) refines the above-mentioned distinctions between two types of communities, by distinguishing 'internal and extended communities of practice' and knowledge and business networks'. She makes these differentiations on the basis of two related dimensions, i.e. *'relationships'*, from simple to complex; and *'connectivity'*, from tight to loose (see figure 1)

(About here Figure 1)

On the one end of the continuum are work groups and project teams, who have clear membership and connectivity. At the other end are informal knowledge networks and business networks where relationships are always shifting and changing. The knowledge and business networks serve primarily to pass along information. They are not held together by a joint purpose, so they are very loose and informal.

Brown and Duguid (2001) show that effective knowledge sharing and creation also can take place in large loosely coupled groups. This happens where large groups have a common practice, such as in scientific associations. *'Where practice is common, communication can be global'*, and so scientists from all over the world can share knowledge, even without knowing each other. But Brown and Duguid prefer to call these groups 'Networks of Practice' (NoPs), since most members will never interact or know each other. NoPs consist of members from various organisations and have a much larger *size*, but with less '*reciprocity*', than CoPs that are internally focused, tight-knit groups who work together on the same or similar tasks. Thus people know each other, which results in high reciprocity. NoPs work on a similar domain, but may never meet, don't take action and produce little (creative) knowledge.

Where Brown and Duguid point at inter-organisational membership as an important determinant of reciprocity and identity, various authors (e.g. Kimble, C., Hildreth, P., and Wright, P. 2000; Ruuska and Vartiainen, 2003; Andriessen et al. 2004) regard *geographical distribution* and *mode of interaction* as a major determining factor concerning interaction and identity building. Some communities consist of members working relatively close together and have mainly face to face meetings. Other communities however are geographically widely distributed and interact mainly electronically or combine the two modes of interaction.

Finally, developmental stages of communities may in some cases be considered as separate types. In the literature two types of stage models are to be found, i.e. life cycle models (from birth to death) and evolution models (from low to high level of maturity). Wenger (2000) and McDermott (1999a) present a life cycle model with stages such as planning, start-up, active, sustain/renew, and close. Gongla and Rizzuto (2001), however, present an evolution model of stages, based on their experience in IBM. The model describes how communities transform themselves, becoming more capable at each stage.

(About here Table 1)

The first two stages are for developing and defining its existence. During these stages and the 'engaged stage' access to one another as community members and individual learning are key functions. At the 'active stage' members are working together to solve business problems and to exploit business opportunities. They make the community's shared knowledge available to external groups. At the adaptive stage, a community has moved to a level where it senses and responds to external conditions. At this stage, the community innovates, creating

significant new business objects—new solutions, new offerings, new methods and new processes. In their view communities can mature and dissolve at any one of these stages beyond the initial formation level. It does not appear to be fruitful to regard the stages in a life cycle model as separate types of communities, but certain stages in evolutionary models may be considered as such because the *purposes* of the community change radically.

The issue of purpose is further differentiated by Andriessen et al. (2004). On the basis of various case studies they came to the conclusion that all communities exist for knowledge sharing, but that this knowledge sharing appears to serve several functions. These functions can be arranged on a dimension of individual versus organisation orientation:

1. solving immediate individual problems, e.g. through sending of and responding to 'who can help me on this problem'-emails in networks of professionals
2. individual learning and building a wider perspective on the practice the group is working in
3. developing best practices, manuals, guidelines for the organisation
4. developing innovative solutions and new processes for the organisation.

Apart from what Collison (see above) called the informal 'communities of practice' and the formal and strategic 'communities of commitment', Andriessen et al. identified two other types of communities, i.e. '*daily practice communities*' and '*problem solving communities*'. The first type consists of employees from different organisational units, in near physical proximity, coming together regularly and face to face to discuss issues of common interest (see ICT provider's Expertise Groups, next section). These groups resemble to some extent the original craft based communities of practice described by e.g. Lave and Wenger (1991) and Orr (1990), in the sense that they are working in relatively close proximity, include experts and new comers, and meet mainly face to face. The 'problem solving community' consists generally of a large number of geographically and organisationally dispersed employees of the same discipline, such as all the hundreds of Oracle employees in Europe and Africa working with ERP systems (see next section). Through the ICT network they exchange questions and answers concerning the solution of certain practical problems. This type of community is comparable to what McDermott calls networks.

Summarising it appears that the notion of 'knowledge communities' covers a variety of organisation related social structures that have a common raison d'être in knowledge sharing. The concept refers to rather loosely coupled networks of employees that cross intra- or inter-organisational boundaries and interact to learn from each other by exchanging information and experiences. According to the literature, however, these social structures differ in the objectives of their knowledge sharing, in their structure, composition and distribution, and in the way they interact and communicate. In table 2 the key characteristics of knowledge communities that were identified by the various authors are presented.

(About here table 2)

This list of aspects will be used to characterise a series of communities that were studied by our group in recent years and by colleagues in a few other countries (see below). The relations between the characterisations of the various communities will then be used as the basis for discovering basic dimensions.

Examples of Knowledge Communities

To give an indication of the variety of Knowledge Communities short descriptions of five of the communities that were studied in the Netherlands are presented.

Food company
This company is a multinational specializing in consumer products in the areas of food, cosmetics and detergents. The company has subsidiaries in approximately 90 countries worldwide. A corporate level unit has started initiatives such as 'Knowledge Workshops' to enhance knowledge sharing and to improve innovative processes. The first knowledge workshop was organized when the company faced problems in the processing of tomatoes, and gave birth to a community of experts. Setting up communities now proceeds quite formally. A high level management 'champion' is committed and together with him ten to twenty organisationally and geographically distributed employees are selected carefully and then asked to join the community. The experts are brought together for a workshop of about a week, to exchange information, to organize the group and care for teambuilding. A facilitator coordinates the group activities. A handbook for facilitators has been developed. The communities are globally dispersed, but certainly in the beginning ICT was hardly used for their communication. One reason appeared to be the incompatibility of the ICT platforms used in the various companies. Moreover, because of their strategic nature many communities are able to have face-to-face meetings once or twice a year.

ICT Service Provider
This company provides ICT services including consultancy, implementation and system integration. These services are provided world wide, with a total of 28,000 staff. Six thousand staff are based in the Netherlands in various geographical locations. Within the company in the Netherlands, there are several types of communities, amongst which (local) 'Expertise Groups' and (national) Performer Groups.

Expertise Groups are initiatives within (Dutch) regional sections of the company. They consist of consultants working in that section, who exchange experiences concerning a work related topic. Examples of CoPs are those focusing on databases, on Microsoft software, or on Java programming, but also one concerning Project Management. They come together face to face about once every four or six weeks. The meetings consist of presentations, talks about projects, sharing literature or new ideas learned in courses attended. They have a formally appointed leader. Most groups have also social events to support the process of building group identity and trust. Each consultant in that section of the company has to be member of at least one Expertise Group and – in some regions - can be a secondary member of one or two others. The use of ICT is very limited since the main interactions take place during the monthly meetings.

Performer User Groups. The company has set up databases of best practices and guidelines for project management in certain domains. The databases include many experiences of project managers. They function as a central information platform, where all staff members, old and new, can find information for their own interest and purposes. No formalized group structures are in place. Large numbers of staff, from all business units, used the Performer system, and they could send comments and if needed interact with others through email. But sense of identity and frequency of interaction, although possible, was limited.

Software company

This company is the world's second largest independent software company. It offers its services in more than 145 countries around the world. The Europe and Middle East Africa (EMEA) division has over 12,000 employees. Communities of practice (or 'Professional Communities' as they are widely known in the company) existed for many years as informal networks of experts with common interests who regularly shared 'tricks of the trade'. However, since the year 2000 there has been a concentrated effort in EMEA to formalize some of these communities. This effort focused on building structured communities of practice that have a specific business purpose and reason for being. On the other hand 'communities of interest' which have no formal structure or sponsorship still play a role in peer-to-peer communication and collaboration.

Currently about 3,500 employees in EMEA (around 30%) are members of one or more communities, such as on systems for ERP, on Customer Relations Management or on Java development. There are over 80 CoPs, with sizes ranging between 17 members to about 500. The main goals of the CoPs are to spread and increase member knowledge, to develop professional skills, to help members to resolve problems quickly, and to help recruit and retain talent within the corporation. The problem solving function appears to dominate in many CoPs.

In all CoPs membership is open to anyone who wishes to join or is interested in the area. Employees must be member of one community, although the employee can choose which community to join. Each community is led by a formally recognized 'Community Leader' who is usually a well-respected subject matter expert with good leadership skills. The majority of these leaders have this role in addition to their primary role within a country organisation and not as a full time job. In many of the most active communities the leaders are supported by a group of core members who drive the community with their active participation.

Network for multiple space use

This network in the domain of multiple space use was established to initiate and stimulate innovations in this area. To reach that goal it has set up approximately ten Communities of Practice. They are initiated by contracting a so-called core-team, which then attracts other members. Every community is supported by a website for sharing documents and finding information on the topic and the members of the community. This website is sparsely used by the community, but face-to-face meetings and excursions are successful. We had the opportunity to study two of these communities in-depth and will report here on the community "Transferia". This community consists of a group of top-level managers of various organisations associated with the issue of developing transport connection points, so-called transferia. This closed group meets about 4 times a year to discuss the possibility of finding *integrated* solutions for the design of such transferia, instead of the traditional way of having one-to-one meetings between project developer and each of the related organisations. These top managers meet to exchange their experiences and viewpoints but also to make deals with their colleagues in an informal setting. Apart from having meetings, the top managers also have excursions to existing transferia, where they interview people at the spot. In this way they can bridge the distance between their high-level office position and the reality of the design and functioning of transferia.

Oil company

The organisation is divided among the three basic businesses of oil, chemicals, and exploration and production (E&P). The 'division' of E&P has ca. 30,000 employees, of which about 70% is member of some kind of network. In 1998 the company contained many small

communities of 20 to 300 members. The groups were mostly informal in origin, with hardly any structure or facilitation. In 1999, the small groups were combined into global networks called communities of practice. In E&P communities can be found on the issues such as sub-surface processes, of surface processes and of wells. Such CoPs may have 1500 to 2000 members. Smaller communities are dealing with issues of e.g. competitive intelligence or of Human Relations Management. The communities have so-called 'hub-coordinators' for facilitation. The role of most communities is limited to daily problem solving. They serve mainly as a source of information for those members who have a problem in their work and seek the expertise of colleagues to solve this problem. Embryonic subgroups may form for a short time, discussing a specific issue. Members do not meet face-to-face, but send their questions and reactions via a simple email discussion list facility. A department responsible for working standards regularly analyses the email messages to find elements that may be turned into standards. In this way shared knowledge is turned into organisational knowledge.

Analysing the data

Characterising knowledge communities

Data collection. In the past few years our group performed many in depth studies of knowledge communities, both intra-company and inter-company (Andriessen et al. 2004; Soekijad 2005, Huis in't Veld in press). The communities presented in the previous section are part of these studies. These communities were rated in terms of the key aspects presented in table 2. An analysis of ten of these communities was the basis for a first conference paper (Andriessen, 2005, at the Communities and Technologies Conference, 2005). Recently, several other studies of series of communities have been performed. The results of three of them have been published (Ruuska and Vartiainen, 2003; Corso and Giacobbe, 2005; Hustad & Teigland, R., 2005). These three research groups, and another from France, were contacted and they cooperated by applying the scoring method to the communities they had been studying. In this way the characteristics of thirty four knowledge communities were rated, i.e. ten in the Netherlands, seven in Italy, eleven in Finland, five in Norway and one in France (see Appendix, table B).

Actually, the number of 34 is a conservative indication, since some of these communities represent in fact a series of 'sister-communities' with the same characteristics. We studied in detail only one food company community, but several other communities in this company are the same in terms of the key aspects. Of the ICT provider's 'expertise groups' (represented by one record in the data matrix) four were studied, while in the software company we assessed six similar communities (in the data matrix only one record). The same applies e.g. to the one French entry in the data matrix, where actually eight communities were analysed.

Can this group of communities be considered as a representative sample? No, they cannot, simply because the population is unknown. It is precisely the purpose of this study 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 whose primary object was the exchange of knowledge. The criterion for including these cases in this study was variety: trying to collect communities from different organisations, purposes, sizes and ways of functioning.

Data analysis. The method to characterise the communities was fine tuned by scoring a first set of ten (Dutch) communities in terms of the key aspects. The items in table two were

operationalised by providing three response categories for each item, corresponding to low, medium and high. Four researchers independently scored the ten Dutch communities. To determine the interrater reliability in terms of consistency estimates (Stemler 2004), Cronbach's alpha coefficient for the four raters was calculated. This coefficient turned out to be .89, which is quite satisfactory. Nevertheless, the correlations between each pair of the four raters varied from .58 to .75. This was also reflected in comments of the raters about some ambiguities in the description of certain scoring categories. These categories were therefore improved on the basis of these comments. Moreover, one aspect, formalisation, was divided into two aspects, i.e. formalisation and origin of the community (by management or by employees). The final scoring method can be found in the Appendix, table A. Given the high interrater reliability, the improvement of the scoring method, and the fact that the key aspects were generally of a descriptive nature, it was considered adequate that only one researcher in the other counties performed the assessment of the communities.

Extracting basic dimensions

The data matrix of 12 variables and 34 communities was analysed through factor analysis. The results are presented in table 3.

(About here table 3)

It appears that certain key aspects are highly related, resulting in the identification of three clusters of aspects, which can be considered as three basic dimensions for differentiating knowledge communities. The identification of clusters does nót imply that all aspects in a cluster are basically identical. Aspects are placed in the same cluster because they tend to go together in the communities studied. Nevertheless, the discussion below will highlight that there are good reasons to speak of three underlying dimensions.

The first dimension consists of the following five aspects: organisational orientation, contract value, formalisation, closed boundaries and experts as members. Communities that have organisational knowledge development as objective tend also to have strong accessibility rules, institutionalized coordination and other formalised rules. Community size appears to be quite strongly (negatively) related to this group of aspects. So, communities scoring high on this dimension are generally small, rather formalized, groups consisting of experts of whom the organisation expects that they develop new organisational knowledge. On the other side of the dimension one finds a focus on individual learning and problem solving, in communities that are open for new, including inexperienced, members and have relatively low formalization. The size relation indicates that on this side of the dimension one can find quite large communities. I call this dimension '**institutionalization'.**

The second dimension is represented mainly by two aspects: Reciprocity and Identity, i.e. degree of interaction between members and degree of feelings of cohesion and belongingness. This dimension I call '**connectivity'.** High on this dimension one finds cohesive communities with much interaction, while communities low on this dimension are rather loosely connected with not much mutual interaction. The members of this second type of community appear to interact mainly with a central database list or coordinator. Not surprisingly, size is also related to this cluster, which means that the larger communities are lower in connectivity.

The third dimension relates primarily to the degree of mediated interaction and also to being geographically dispersed. This dimension is called '**virtuality'.** High on this dimension are communities that interact mostly through electronic media, because they tend to be geographically dispersed, while low scoring communities are those whose members interact often face to face and can do so because they work relatively closely together. Again, size has

some relation to this factor, implying that the dispersed communities tend to be larger than the face to face meeting communities. It is indeed plausible that large communities, such as the widely dispersed software company communities described above, can only exist by virtue of the electronic communication media, while e.g. the 'expertise groups' of the ICT company can meet face to face because they are generally not larger than about twenty members. The correlation between the two constituent aspects is only .41, which implies that mediated interaction does not necessarily imply geographical dispersion. It is indeed well known that many globally distributed communities, such as the food company community, try to organise face to face meetings for their interaction. Nevertheless, according to the factor analysis these two aspects have comparable relations to other aspects, which justifies their combination into a third dimension. It is also worth pointing out that the aspect of being intra- or inter-organisational does not relate to this dimension.

The factor analysis results in a fourth dimension, with eigenvalue barely above 1. The key aspect in this factor is the aspect of 'origin', i.e. whether the community is initiated by management or by the employees. According to the correlation matrix (Appendix, table C) this aspect is only slightly, but not significantly, related to other aspects. It was expected that individual oriented communities with low contract value and formalisation would generally be initiated by employees, but inspection of the data matrix revealed that this is not the case. It is unclear whether this is due to the fact that this aspect is not well operationalised or to a wrong view concerning the role of initiation of communities. This fourth dimension and the origin aspect will further be left out of the discussion.

The first two dimensions are related to important key characteristics of organisational units. Formalisation and institutionalisation are major control mechanisms for organisational units. It is interesting to note that knowledge communities can strongly differ in this aspect. The fact that many of the communities are informal is in line with the original theories about communities of practice (e.g. Lave and Wenger 1991). However, there are also knowledge sharing communities who institutionalised to a certain degree, although not to the degree of formalisation such as clear product orientation and planning.

The second dimension is as well quite central to organisational functioning. Cohesion, identity, generally caused by frequent interaction and communication, is important for groups to develop trust and to cooperate well. This dimension is clearly related to the distinction between weakly tied and strongly tied networks by Granovetter (1973).

The third dimension play a strong role in traditional organisation theory. However, virtual teams and dispersed interaction is increasingly characteristic for many modern organisations and hasimportant implications for cooperation and coordination (Andriessen, 2003).

Identifying basic types

In order to discover how the communities studied were distributed over the three dimensions, sum scores were calculated for the three dimensions, i.e. an institutionalisation score (variable 1 + 2 + 3 + 5 + 6, minimum score = 5, maximum = 15), a connectivity score (variable 7 + 8, min=2, max=6) and a virtuality score (variable 11 + 12, min=2, max=6). The thirty four communities (the little circles in figure 2) were than plotted in a three dimensional space consisting of the three dimensions. As far as the two dimensions of institutionalisation and connectivity are concerned (see figure 2), it appears that the communities are scattered over the larger part of this two dimensional space, except for the lower right corner. Only one community is found in this quadrant and it appears that this community has been initiated as a highly institutionalised community, but was not active anymore, so interaction and cohesion is almost non existent. This interpretation of the lower quadrant seems to be the only viable

interpretation, because an *active* community with high institutionalisation but low connectivity seems to be an oxymoron. Nevertheless, this point will be taken up again in the next section (see 'delphi communities').

The simplest interpretation of figure 2 would be that the other three quadrants constitute three basic types of knowledge communities. However, a more detailed analysis of the first 10 communities, suggest that knowledge communities do cluster in four types as shown in figure 2.

(About here Figure 2)

These communities can be described in the following way.

1. Strategic Communities i.e. small cohesive groups of experts whose activities are focused on organisational learning. They are highly supported with resources and have a strong 'contract value' i.e. they are expected (implicitly or explicitly) to perform for the company, i.e. to develop best practices or even innovative solutions. They generally consist of a limited number of experts, without any periphery of 'lurkers', since membership is not open. The food company community (see section above) is a good example of this type. In some cases (like BP's Communities of Commitment), these groups may cross the border between knowledge communities (learning oriented) and workgroups or task forces (product oriented). Like most knowledge communities in large companies, many of these strategic communities are organisationally and geographically distributed and communicate therefore electronically. Some of them however do limit their interaction mainly to face-to-face meetings. Some studies suggest that strategic communities require intensive preparation, member selection, support and coordination to be effective.

2. Informal Communities, i.e. groups of employees with a common area of interest, often closely related to their work (practice), having substantial interaction, a common history and 'culture' (shared concepts, ideas, stories etc). Their main purpose is to learn from each other; while transfer of this common knowledge to the company is of less importance. However, some organisations recognize the potential gap between individual learning and organisational learning and appoint specialists who have to analyse what is discussed in these communities and who turn this harvest into new ideas, concepts and guidelines for the organisation.

These communities are generally not very formalized, although some may receive support when they have proven their value. Thy are to some extent similar to the original Lave and Wenger (1991) communities of practice (although geographically and organisationally much more dispersed), which may be the reason that most of them are called 'Community of Practice', while most other knowledge sharing communities receive other names. They grow spontaneously, are either small altogether or have a small core and a larger circle of peripheral members. A very active coordinator or core group and adequate ICT support are generally required as success conditions.

3. Interest Groups, i.e. groups of people who have no other interest than to hear and learn individually about a certain topic. These groups have very low formality, members come in and leave easily, the boundaries are quite vague and there is limited interaction and identity. Most members do not interact or know each other and the main knowledge exchanging activity is often that individual members all interact bilaterally with the same information source. The earlier described 'Performer group' is a good example. The notion of 'community' is therefore hardly applicable to these groups, reason why they are generally not included in discussions on communities of practice. They are often very large, such as all employees who consult the same company intranet and who have as common identity only the fact that they are all member of the same company. All these groups have high virtuality, i.e. communication in this type of community is through electronic means. Actually the

existence of Intranets and other electronic means have given rise to this type of networks. The quality of Interest Groups is dependent on the quality of the information provided and the accessibility of the website.

4. Knowledge Networks. Some studies identify communities with intermediate interaction and identity, i.e. between the Informal Communities and the Interest Groups. Brown and Duguid (1991) speak of Network of Professionals (NoPs), who consist of members from various organisations and are much larger than what they call CoPs. The members of NoPs work on a similar domain and communicate, but may never meet and don't take common action. McDermott (1999b) speaks of networks of people who share a common interest, exchange questions and solutions, but have little sense of common identity and never or rarely meet as a network. Andriessen et al. (2004) identified the Problem Solving Communities, of which two are also part of the communities studied in this publication, i.e. the communities in the oil company and in the software company. They consist of employees who exchange, over a company intranet, questions and answers concerning the solution of certain practical problems ("Who can help me with …."). Although their size may be quite large (many hundreds of members), they still display some form of group identity, based on commonality in function and organisation. Knowledge Networks have limited purposes and seem to thrive without many success conditions, except minimal commitment and good email connections.

The Delphi Community? The existence of the empty quadrant in figure 2 raises the question about a possible fifth type of community. This would imply the existence of a network of professionals, with high organisation- (and innovation-) orientation and with high formality, but with low interaction and common identity. A social structure with these characteristics seems at first sight to be quite a strange phenomenon. High formality, such as reflected in selective recruitment of members, having rules and roles, such as a coordinator, seems to be difficult to combine with lack of interaction and group feeling. Nevertheless it is possible to envisage theoretically such a phenomenon (although it would probably not be called a 'community'). It would consist of a number of selected experts, who do not interact reciprocally and have no cohesion whatsoever. However, a coordinator would deal bilaterally with these experts, and he could 'extract' innovative ideas for the company through a kind of Delphi methodology. The approach implies that the experts provide opinions and ideas and react upon the suggestions of the other experts. This is a kind of knowledge sharing. Although I do not know of the existence of such a group, it may serve the purpose of exchanging knowledge for the sake of both personal learning and organisational innovation. It would therefore belong to the 'family' of knowledge sharing communities.

Dispersion and mediated communication. The first two dimensions appear to be sufficient to identify the five basic types. The third dimension refers to geographical dispersion and communication mode and is called 'Virtuality'. Plotting the communities into the two dimensional spaces made up by Institutionalisation with Virtuality or Connectivity with Virtuality, results in figure 3.

(About here figure 3)

With regard to *connectivity*, it turns out that communities with low connectivity ánd having face to face interaction or close proximity do not exist, at least not in our sample. This is quite logical, since lowly connected communities are the Interest Groups (and perhaps some knowledge networks) who exist by the virtue of the Internet. Virtuality and *institutionalisation* are not at all related, which means that all combinations are possible. Indeed, examples can be found of highly institutionalised communities (strategic communities) which are virtual and others who are not virtual, and the same applies to less institutionalised communities.

Together these findings imply that Strategic Communities and Informal Communities can be both virtual and directly interacting, while Interest Groups (and the majority of the Knowledge Networks) are always Internet based and dispersed.

Discussion

The analysis in this article has resulted in the identification of five basic types of knowledge sharing communities, of which one, the Delphi community, has not been identified or recognized yet in community research, but whose existence is theoretically conceivable. The Strategic Community is characterised by high interaction and identity and also high formalization, existing only of a 'core' of members. The Informal Community has high interaction and identity, but low formalization. It often consists of a core of active members and a large periphery. Knowledge Networks have medium interaction and low formality and often also a core – periphery differentiation. Interest Groups have both low interaction and low formalization and may be said to exist only of peripheral members. The Delphi Community finally has low interaction and identity but high institutionalization. There is no core and no periphery, but only a process of 'extraction' of information by a coordinator.

Terminology. Having identified four or perhaps five basic types implies that one should be very careful with the use of terms. Different terms have been used such as: community of practice, community of interest, community of commitment, interest group, network, network of practice, knowledge network, knowledge community, internal community, expanded community, formal network and epistemic community. Some terms denote the same phenomenon, while the same term of 'community of practice' has been applied to different types of communities. I propose to employ, in the context of organisational exchange of information and knowledge, the terms 'community of practice' and 'knowledge (sharing) community' interchangeably, referring in both cases to strategic communities, informal communities and knowledge networks

Dynamic changes. Of course these five are ideal types, in the sense that in actual practice communities may be found that have characteristics of more than one type or oscillate between types. The concept of basic type should not be associated with stability. On the contrary, communities may have shifting membership and also shifting purposes. Particularly a shift of purpose over time is quite common. Actually, communities are not static but dynamic. Classification may help in the identification of certain characteristics and in developing support, but communities often change in nature. In a previous section the difference between life cycle dynamics (from birth to death) and evolutionary dynamics (from low to high level of maturity) was expounded. A third type of dynamics may be called s*ubgrouping*. In our experience communities thrive and change also through the emergence of subgroups. The purpose of these subgroups may be to prepare a special meeting, to develop a certain plan, which is afterwards again discussed in the whole community, or just to communicate about a special issue that may not (yet) be interesting for the whole community. An example is what happened in the database community of the ICT provider, where a subgroup of members developed a plan to transfer their experience in the newest database design methods to the rest of the company. In this case the subgroup is similar to a Strategic Community, while the rest has the characteristics of an Informal Community

Research agenda: The central dimensions and the basic types have been identified on the basis of an in-depth analysis of literature and case study material. Together they can be viewed as a theory about the variety of knowledge sharing groups. Empirical research is needed however to confirm the findings of this study and perhaps to specify the theory. This implies particular attention to the following issues.

The thirty four communities analysed in this study are by no means collected as a representative sample. In fact, it would have been impossible to do that because the population was not defined. After this study, questions about population and sampling can be better formulated and further studies can refine or adapt the classification.

The classification is based on the twelve key aspects identified through the literature study. Although these twelve are derived from the experience of well known scholars other characteristics may also be identified as key aspects. This is a matter for further discussion and study.

A theoretically interesting but also practically relevant point is the notion of the Delphi community. Empirical studies should reveal whether this type does exist already and practitioners may consider whether it is useful to develop it.

Given the existence of different types of knowledge communities, it is important to study the processes within and particularly the success conditions for each of them. In many studies no clear distinction has been made and conclusions about how to organise and facilitate communities have often been too general in this respect.

Finally, this analysis has been limited to communities in or between organisations. Will the same basic dimensions or types of communities be found in the world of e.g. open source communities or neighbourhood communities? Of course this should be studied empirically, but some results will probably be replicated in these other contexts. Differences in institutionalisation apply in principle in all social structures and the same holds for differences in interaction intensity and in virtuality, except for on-line communities which will have no variation in virtuality. Nevertheless it is quite possible that extra key aspects play a role in these other worlds and that empirical analysis will result in the identification of other basic types of communities.

To answers these questions it is necessary to compare systematically the characteristics of knowledge communities. Towards this end a research program and standardized assessment tools have been developed (Andriessen and Verburg 2004).

Acknowledgements

This publication is based on intensive discussions with, and case studies by my colleagues Maura Soekijad (Soekijad, 2005) and Mirjam Huis In't Veld (2006). I also thank Andrea Giacobbe, Eli Hustad, Inkeri Ruuska and Isabelle Bourdon for their willingness to rate the communities they have studied in terms of my scoring method.

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Appendix

a. Purpose: All communities have as basic purpose to exchange and share knowledge. But this knowledge sharing can have an *individual learning* purpose or an *organisational product* purpose:

Score 1, if: the Cop has mainly an individual orientation, i.e. exchanging information for solving personal problems and learning

Score 2, if the CoP has both

Score 3, if the CoP has mainly an organisational orientation, i.e. members work together as a group, for instance to test applications, to develop training material, to collect best practices or to develop innovative solutions for the organisation.

b. Contract value: Degree to which the community is explicitly required by the company to deliver concrete results. A medium position would be where the organisation evaluates regularly whether the community is sufficiently active.

1= no or hardly explicit output required; 2= medium (regular evaluation); 3=explicitly output required

c. Formalization: having more or less formal meetings and an appointed coordinator; being formally set-up by management and clearly visible to management.

1=low formalisation, e.g. no formally appointed leader, few rules and procedures 2=in between; 3=high formalisation, e.g. appointed leader, several rules and procedures

d. Origin: 1=initiated by higher management; 2=both, 3=initiated bottom up by employees with common interests

e. Composition: only employees with long experience in the subject of the community, or both experienced employees and newcomers.

1=old-timers and newcomers; 3=only old-timers

f. Boundary: whether the community is closed or open for employees of the company.

1=open for company employees; 2=limited membership access; 3=closed membership, i.e. members are selected

g. Reciprocity (connectivity): degree and frequency with which members interact mutually and know each other.

1=low level of interaction and knowing each other; 2=medium; 3=high level

h. Identity: Feelings of cohesion, trust and belongingness;

1=low level of shared feeling of group identity and cohesion; 2=medium; 3=high level

i. Size of the CoP

1=less than 40; 2=40 - 150; 3= >150 members

j. Intra- or inter-organisational

1=Inter-organisational; 2=Intra-organisational but from different business units in a large company; 3=Intra-organisational in a relatively small company

k. Geographical dispersion of members

1=employees work in such close proximity (ca 50 km distance) that they can easily meet face to face (=local); 2=they work in the same country (national); 3=they work internationally distributed

l. Mode of interaction: communication takes place face to face and/or via ICT media.

1=mainly face to face communication, very limited ICT based; 2=both; 3=mainly ICT based communication

Table A. Scoring method for key aspects.

	Organisation	**Domain of community studied**
	The Netherlands	
1	Multinational in food	Tomato processing
2	ICT Service provider	Databases
3	Idem	Databases
4	Idem	Project management
5	Idem	Project management
6	Alliance of companies and institutions for multiple space use	Multiple space use
7	Idem	Transport connection points
8	Software company	CRM eCommerce
9	Oil company	Oil drilling
10	Network of research institutions	Hydraulic engineering
	Italy	
11	Telecom Company	Sales to SMEs
12	Idem	Call Centres
13	Bank	Personal banking for large customers
14	Idem	Call Centres
15	ICT service provider	Telecom technologies
16	Advertising company	Sales
17	ICT Consulting firm	Function point metrics to evaluate software
	Finland	
18	Internet consultancy	Digital marketing
19	Idem	Visual design
20	Idem	Project management
21`	Telecom company	Business intelligence
22	Networks service company	Project management
23	Idem	Digital TV receivers
24	Idem	Digital TV network management
25	Idem	Digital TV distribution
26	Messaging / Logistics service company	Project management
27	Banking group	Long term savings
28	Research institution	Environment research
	Norway	
30	Marine insurance and underwriting	Marine Underwriting
31	Idem	Contract Consultancy
32	Idem	Finance underwriting
33	Idem	Protection and Indemnity, intra-organisational
34	Idem	Protection and Indemnity, inter-organisational
	France	
35	Optical products	R&D

Table B. The 34 communities studied

	Organ. orient	Contract value	Formali zation	Origin bottom	Expert mem-bers	Closed bound aries	Recipr ocity	Iden tity	Size	Intra-org	Disper sion	Media -ted inter-action
Organ. Orient	1,000	,551	,513	-,182	,450	,506	-,081	,043	-,580	-,341	,144	-,130
Contract value	,551	1,000	,618	-,176	,199	,505	-,042	-,007	-,305	-,435	,173	-,180
Formalization	,513	,618	1,000	-,293	,357	,354	-,082	,068	-,391	-,272	-,094	-,440
Origin bottom	-,182	-,176	-,293	1,000	-,183	-,250	,013	,154	,056	-,174	,250	,139
Expert members	,450	,199	,357	-,183	1,000	,426	-,030	,301	-,411	-,214	-,020	-,148
Closed boundaries	,506	,505	,354	-,250	,426	1,000	-,021	,265	-,248	-,164	,183	,027
Reciprocity	-,081	-,042	-,082	,013	-,030	-,021	1,000	,499	-,264	,434	-,468	-,308
Identity	,043	-,007	,068	,154	,301	,265	,499	1,000	-,327	,157	-,284	-,133
Size	-,580	-,305	-,391	,056	-,411	-,248	-,264	-,327	1,000	,123	,150	,462
Intra-org	-,341	-,435	-,272	-,174	-,214	-,164	,434	,157	,123	1,000	-,383	,216
Dispersion	,144	,173	-,094	,250	-,020	,183	-,468	-,284	,150	-,383	1,000	,407
Mediated interaction	-,130	-,180	-,440	,139	-,148	,027	-,308	-,133	,462	,216	,407	1,000

Table C. Correlation matrix for 12 key aspects. N = 34; Pearson PM coefficients.
>.44 is significant at .01 level, >.55 is significant at .001 level.

Work groups	Project teams	Internal CoPs	Extended CoPs	Knowledge Networks	Business Networks
Tight			*Connectivity*		Loose
Simple			*Relationships*		Complex

Figure 1. Different types of communities and networks (after Allee, 2000)

	Potential	Building	Engaged	Active	Adaptive
Definition	A community is forming	The community defines itself and formalizes its operating principles.	The community executes and improves its processes.	The community demonstrates benefits from the collective work of the community.	The community and the organisation(s) are using knowledge for competitive advantage.
Fundamental functions	Connection	Memory and context creation	Access and learning	Collaboration	Innovation and generation

Table 1: Stages in the evolution of communities (Gongla and Rizzuto, 2001)

- *Purpose*: Having a common mission versus only exchanging information (Allee), or also: having an organisational orientation, i.e. developing best practices or even innovative solutions, versus an individual orientation, i.e. exchanging information for solving personal problems and learning (Gongla and Rizzuto 2001; Andriessen et al. 2004).
- *Contract value*: degree to which the community has to deliver concrete results (Collison 1999).
- *Formalization*: having more or less formal meetings and an appointed coordinator (Collison 1999); formally set-up by management and clearly visible to management (Botkin 1999).
- *Composition*: only experts or both experts and newcomers (Collison 1999).
- *Boundary*: whether the community is closed or open for new members (Collison 1999; Brown and Duguid 2001), having fixed or shifting relationships and membership (Allee 2000).
- *Reciprocity* (connectivity): degree to which members interact mutually and know each other (Brown and Duguid 2001; Allee 2000)
- *Identity*: Feelings of cohesion, trust and belongingness (McDermott 1999a; Botkin 1999);
- *Size of the community* (Brown and Duguid 2001)
- *Intra- or inter-organisational* (Brown and Duguid 2001)
- *Geographical dispersion* (Kimble et al. 2000; Ruuska and Vartiainen, 2003)
- *Mode of interaction*: face to face and/or via ICT (Kimble et al. 2000; Ruuska and Vartiainen, 2003).

Table 2. Key aspects of knowledge sharing communities

Rotated Component Matrix(a)

	Component			
	1	2	3	4
Org. orient	**,801**	-,116	-,181	,011
Contract value	**,677**	-,280	-,275	-,033
Formalization	**,592**	-,165	-,530	-,224
Origin bottom	-,240	,080	,079	**,888**
Old time members	**,679**	,187	-,034	,000
Closed boundaries	**,821**	,067	,235	-,129
Reciprocity	-,075	**,802**	-,222	-,054
Identity	,295	**,796**	,017	,241
Size	-,538	-,329	,489	-,148
Intra-org	-,356	,569	,310	-,482
Dispersion	,230	-,554	**,449**	,433
Mediated interaction	-,069	-,156	**,897**	,031

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Table 3. Results of the factor analysis.

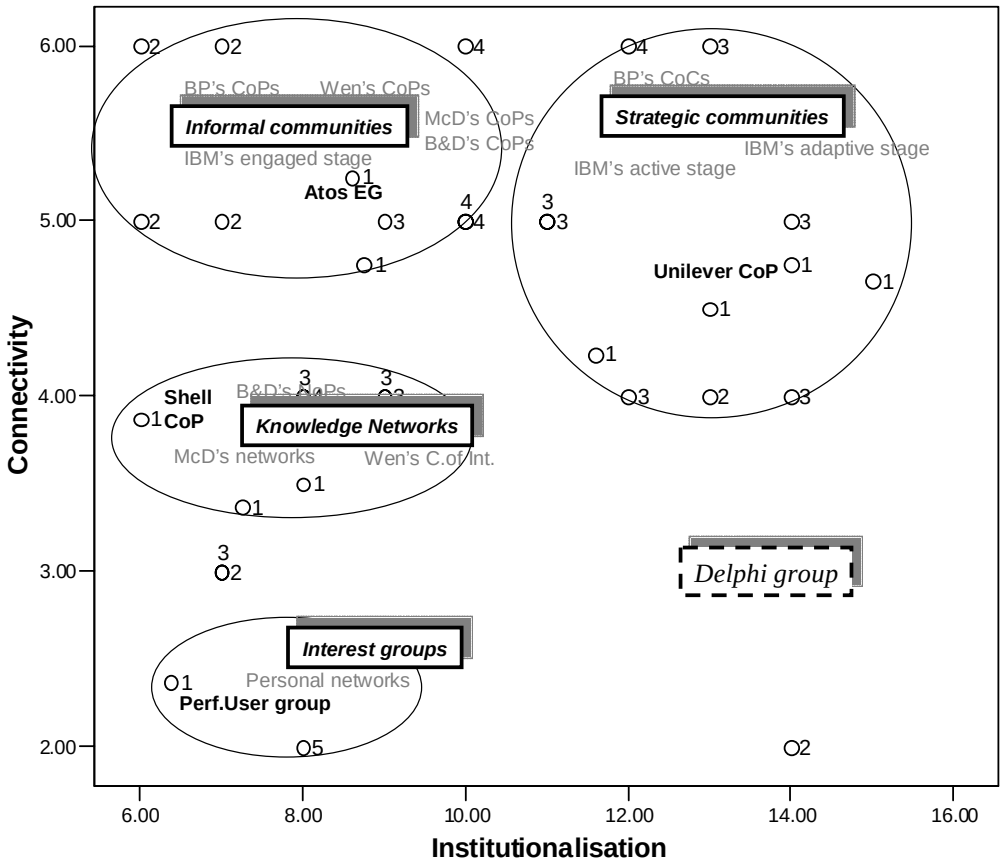

Figure 2. A classification of Knowledge Communities in two dimensional space
- 1=Dutch study, 2=Italian, 3=Finnish, 4=Norwegian, 5=French
- Four communities in bold are described in earlier section of this publication
- B&D=study by Brown and Duguid; BP=British Petrol; McD=McDermott; Wen=Wenger

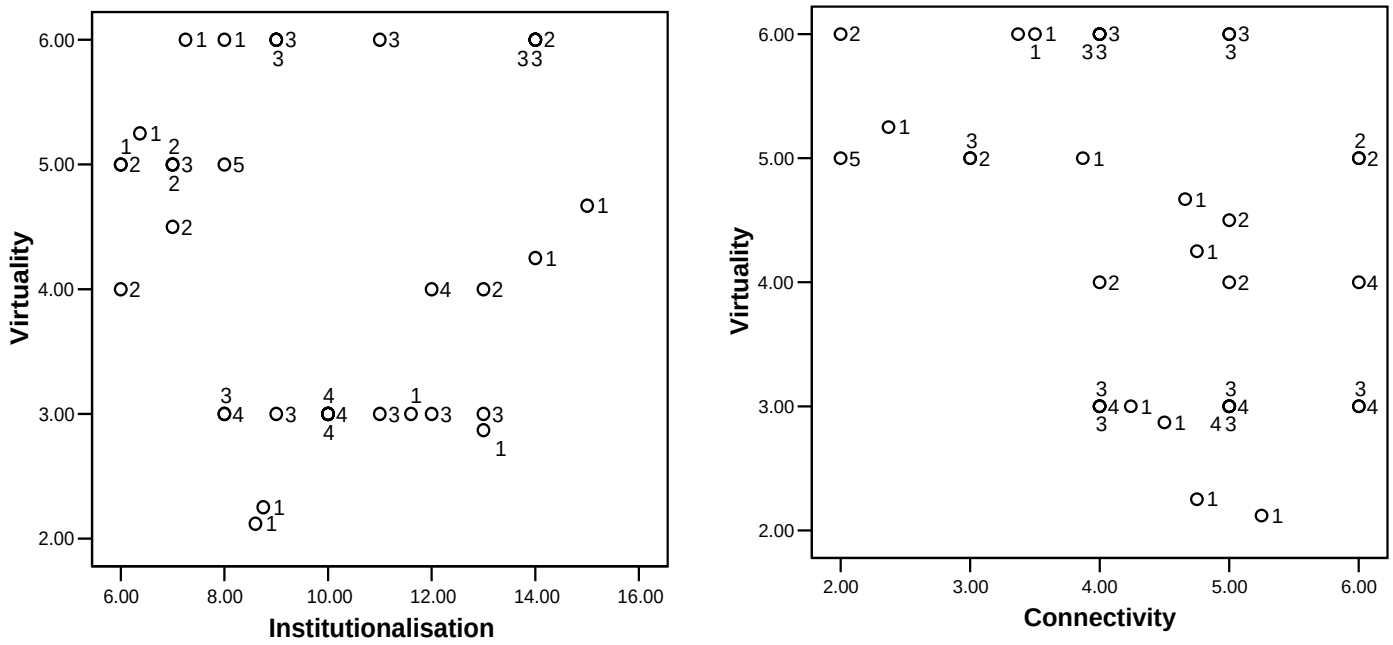

Figure 3. Scattergrams for the dimension of Virtuality against the first two dimensions
1=Dutch study, 2=Italian, 3=Finnish, 4=Norwegian, 5=French

J. H. Erik Andriessen

J. H. Erik Andriessen is professor of Work and Organisational Psychology at the University of Technology in Delft, The Netherlands. He and his group are involved in research with regards to new forms of work and organisation, knowledge management and communities of practice, distributed teamwork, innovation processes and evaluation methodology. He has published widely, his latest books are on Knowledge Management and on Mobile Virtual Work.

Address: Delft University of Technology; Faculty of Technology, Policy and Management
Jaffalaan 5, 2628 BX DELFT, the Netherlands, Tel: +31 15 278 3720, Fax: +31 15 278 2950,
E-mail: erika@tbm.tudelft.nl