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Discussion Paper

No. 2007-04

**COGNITIVE DISTANCE IN AND BETWEEN COP'S AND
FIRMS: WHERE DO EXPLOITATION AND EXPLORATION
TAKE PLACE, AND HOW ARE THEY CONNECTED?**

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October 2006

ISSN 0924-7815

Cognitive distance in and between COP's and firms: where do exploitation and exploration take place, and how are they connected?

Paper for DIME workshop on Communities of Practice, Durham, 27-28 October 2006

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JEL Code: D02, D21, L22, O31, O32

Key words: innovation, exploration and exploitation, communities of practice.

Abstract

This paper contributes to the analysis of where and how both exploitation and exploration may take place inside and between communities and organizations. It connects with the discussion of differences between communities of practice and epistemic communities. The analysis allows for differences in cognition within communities of practice ('cognitive distance'). Such distance yields potential novelty but creates problems in utilizing that potential. In communities of practice and epistemic communities different trade-offs are made between the advantages and disadvantages of cognitive distance. Communities of practice are more oriented at exploitation, at relatively small cognitive distance. Exploration may take place in epistemic communities, with larger internal cognitive distance, but may also arise from interaction between different communities of practice, utilizing the distance between them. Organizations serve to provide the basis for the governance of such interaction. This, however, does limit the cognitive distance, and hence exploration potential, within an organization. For more radical exploration, interaction is needed between organizations, at the price of greater efforts to set up and govern collaboration. Next to communities of practice, epistemic communities and organizations, the analysis also includes communities of professionals across different organizations. They also have a role to play in a wider system of organizational forms for exploitation and exploration.

Introduction

A central issue in theories of organizational learning concerns the relation between knowledge of individuals and knowledge on the level of an organization (Cohen 1991, Cook & Yanow 1993, Weick & Westley 1996). According to Weick (1991), organisational learning entails a process of acquiring common knowledge, or beliefs, or norms, which includes the process of accepting and validating individually acquired knowledge as useful (Duncan and Weiss, 1979). In this process there is an important intermediate level of 'communities', between an organization as a whole and individual people. There, knowledge links between individuals are achieved and common knowledge is acquired. The notion of Communities Of Practice (COP's), initiated by Lave & Wenger (1991) and Brown & Duguid (1991), and identified as a mechanism through which knowledge is held, transferred and created, has attracted much attention as well as considerable criticism and confusion (e.g. see Cohendet et al. 2001, Contu & Wilmott 2003, Bogenrieder & Nooteboom 2004a, Roberts 2006, Handley et al. 2006).

Here, I consider three issues. The first concerns the diversity of knowledge and interests, and hence possible tensions and conflicts of interest, and differences of power, within a COP, which are in danger of being neglected due to the connotation, intended or not, of a 'community' as being 'warm', consensual and without conflict. A second issue, which forms the central subject of the present paper, is whether, or to what extent, COP's are fit not only for holding, sharing and improving knowledge and competence, in exploitation, but also for creating new knowledge and competence, in exploration (March 1991). In exploitation there is plasticity of routines, but not the replacement of routines by new ones. The distinction between exploitation and exploration is comparable to 'first order' in contrast with 'second order' learning (Bateson 1973), and to 'single loop', in contrast with 'double loop' learning (Argyris & Schön 1978), and perhaps also to 'incremental' in contrast with 'radical' innovation. In the first, there is variation within a basic framework or set of principles, and in the latter there is a break of the framework. Or in yet other words, in the first there is improvisation and variation, while in the latter there is invention. The two issues of diversity and exploration are related. Exploratory learning requires diversity of knowledge, which may be combined into something new, in Schumpeterian 'novel combinations'. A third issue is that COP's are defined in such wide and general terms that they could encompass a wide variety of groups of people working together.

According to Wenger (1998), members of COP's establish relationships and norms of behaviour through *mutual engagement*, are bound together by an understanding and sense of *joint enterprise*, and produce a *shared repertoire* of language, routines, artifacts and stories. Wenger and Snyder (2000:139, 140) characterize a community of practice as follows:

a 'group of people informally bound together by shared expertise and passion for a joint enterprise', which can 'drive strategy, generate new lines of business, solve problems, promote the spread of best practices, develop professional skills, and help companies to recruit and retain talent'.

This can be interpreted so widely as to allow for both exploitation and exploration. However, the 'shared expertise and repertoire' raise doubt concerning cognitive variety

within a COP, needed for innovation. The ‘joint enterprise and binding together’ suggest dense, strong, durable ties, while the social network literature suggests that for novelty ties should be sparse (non-redundant) and weak (Granovetter 1973, Burt 1992, 2000). With a set of criteria concerning the structure, content and strength of ties, and type and variety of knowledge or competence involved, Bogenrieder and Nooteboom (2004a) provided a basis for a more precise classification of a wide variety of learning groups according to how they score on those criteria. Interpreting COP’s in terms of that classification, in an empirical study of five learning groups they found none that closely fitted that interpretation of COP’s.

In view of doubts concerning the innovative potential of COP’s, several authors (Haas 1992, Steinmüller 2000, Cowan, David & Foray 2000, Cohendet et al. 2001, Cohendet 2005) have proposed and discussed the contrasting notion of ‘epistemic communities’ (EC). EC are commonly defined as groups or networks of people who perform exploratory learning. They engage in transdisciplinary and/or transfunctional activities, at the interstices between the various disciplines. In contrast with communities of practice, they are not organized around a common discipline or practice but around a common topic or problem.

In a later paper, Wenger et al. (2002: 141, quoted in Roberts 2006: 626) acknowledged the ‘downside’ of COP’s, where ‘the very qualities that make a community an ideal structure for learning – a shared perspective on a domain, trust, a communal identity, longstanding relationships an established practice – are the same qualities that can hold it hostage to its history and its achievements’. Here, it is important to distinguish between learning in the sense of absorbing existing knowledge from others and learning in the sense of discovery or invention. For the first, a COP provides an ideal environment, for an entrant in a COP to learn its practices. For the second, there is great doubt.

The purpose of the present paper is to further analyse the differences and connections between communities for exploitation and exploration. First, the paper discusses the notions of exploitation and exploration, and an underlying ‘activity theory’ of cognition. Here, cognition is a wide notion, which includes both competence (knowledge, learning) and governance (moral norms, values and feelings). Second, it picks up the issue of variety within and between communities. It discusses and employs the notion of ‘cognitive distance’, as a construct for cognitive and moral variety, and its effect on collaboration and learning. Third, the paper considers the cognitive and cultural identity of communities, as a basis for limiting (intellectual and moral) cognitive distance. Fourth, it analyzes cognitive distance within COP’s, between COP’s within firms, and between firms, and the implications for the locus of exploitation and exploration. It ends with the proposition that COP’s serve primarily as units of exploitation, with limited cognitive distance and a certain focus on substantive issues and personalized governance, while between COP’s, within a firm, cognitive distance is greater, with a wider focus of substantive issues, yielding more exploration, but with still some limitation of cognitive distance, especially on moral issues, while between firms cognitive distance opens up further, also on moral issues, which further widens the potential for exploration.

Activity theory of cognition and meaning

In their account of communities of practice, Brown & Duguid (1991) and Lave & Wenger (1991) employed an ‘activity-theory’ or ‘situated action theory’ of knowledge (see e.g. Blackler 1995), inspired also by the work of Kolb (1984), in which action and learning feed each other, and where ‘learning is a bridge between working and innovation’. Brown and Duguid employed the notion of ‘canonical’ and ‘non-canonical’ or ‘procedural’ (Cohen & Bacdayan 1996) knowledge. Canonical knowledge entails decontextualized, codified and formalized rules for operation. Inevitably, such rules cannot cover the richness and the variability of practical contexts. It is by context-dependent deviations from canonical rules, with the ensuing need for improvisation and experimentation (Brown & Duguid employed Levy-Strauss’ concept of *bricolage*) that learning arises, also in the sense of a shift of knowledge, in interaction between members of the community. This is based on ‘storytelling’, to capture and share context-bound experience, to guide experimentation. As a result, communities emerge from shared work practice rather than that they are designed *ex ante*.

The notion that cognition is *embedded*, and arises from interaction with the environment, goes back to Vygotsky (1962) and Piaget (1970, 1974), with their idea that ‘intelligence is internalised action’.¹ In sociology, the idea that cognition arises from interaction of people with their (especially social) environment arises, in particular, in the ‘symbolic interactionism’ proposed by G.H. Mead (1934, 1984). In the organization literature, this has been introduced, in particular, by Weick (1979, 1995), who reconstructed organization as a ‘sense-making system’.

The notion that cognition is embedded in practice and also rooted in the body arises also in recent work of cognitive scientists (Damasio 1995, 2003, Edelman 1987, 1992, Lakoff & Johnson 1999). In philosophy, it goes back to Merleau-Ponty (1964), who also argued that ‘the light of reason is rooted in the darkness of the body’. Building on the philosophy of Spinoza, Damasio (2003) demonstrated a hierarchy of cognition, where rationality is driven by feelings, which in turn have a substrate of physiology, in a ‘signaling from body to brain’. The process of association yields many un- or subconscious neural structures that constitute what we experience as intuition. Since those are automatic they are often experienced as more ‘authentic’ and ‘intrinsic’ than rational evaluation. They do have the advantage of being faster than rational evaluation,

¹ I am aware of the criticism of Piaget’s views and methodology of research (cf. Flavell 1967). However, I still think that some of his basic intuitions and ideas are valid. Apart from methodological criticism of Piaget’s work, a substantive point of criticism is that Piaget’s view is under-socialised. Here, there was an interesting difference of interpretation between Piaget and Vygotsky. In language acquisition by children, a phenomenon on which Piaget and Vygotsky agreed was that at some point children engage in ego-centric speech, oriented towards the self rather than social others, and that this subsequently declines. Piaget interpreted this as an outward movement *from* the self to the social other; a ‘decentration’ from the self. Vygotsky ascribed it to a continued movement *into* the self, in an ongoing process of formation and identification of the self and development of independent thought. The reason that egocentric speech declines is that overt speech is partly replaced by ‘inner speech’. I think Vygotsky’s interpretation is the correct one.

and this fast response on the basis of mental routines has survival value, in the flight from danger and the spurt towards opportunity. Intuitions and reflexes are typically laden with emotion, which affects how deeply they are embedded and how easily, and on what occasions, they are triggered. Symbols typically trigger intuitions or reflexes with an appeal to their emotional content (Siemsen 2006).

Embeddedness of cognition goes together with embeddedness of meaning. The reference of terms is generally indeterminate without their embedding in a specific action context, *in combination with* the embodied web of largely tacit belief. John Searle used the notion of ‘background’, illustrated with the eating of a hamburger.² Unspecified, but obvious, is the condition that the hamburger enters the body not by the ear but by the mouth. I suggest that the background consists of the *cognitive* background, in a seamless web of cognition (Quine & Ullian 1970), of the observer, *and* the context, of words in a sentence, in a context of *action*. The latter triggers associations between connotations embodied in the former. In this way, embedding is needed to disambiguate expressions that by themselves are underdetermined in their reference.

A second effect of embeddedness of meaning, I propose, is that any event of interpretation, in a context of action, shifts meanings. Even memory is not simple retrieval, but reconstruction based on the context, and this reconstruction alters the memory. In sum, we grasp our actions in the world to both disambiguate and construct meaning. How do meanings of words change in their use? Neural structures provide the basis for categorization, i.e. assigning a perceived object to a semantic class, on the basis of patterns of connotations that distinguish one category from another. It seems, however, that the activity of categorization brings in novel connotations, or patterns of them, from specific contexts of action, and affects the distribution of connotations across categories. Then, an expression (sentence, term, sign) never has the exact same meaning across different contexts of action. Furthermore, I propose that any such act of interpretation shifts the basis for it. Associations between terms, on the basis of shared or linked connotations, shift the distribution of those connotations across terms.

In neurophysiological terms, this is embodied in selection and strengthening and weakening of connections between neuronal groups, as described by professor Edelman. In the brain, association arises from neurons being activated (‘firing’) simultaneously, which, when repeated, yields novel physical connections between the neurons, as a result of which later activation of one of them triggers activation of the other. Could this be indicative of a more general logic of structuration where structures in their mutual influence can function efficiently while changing in the process?

There is much left to be investigated in the study of how the structuration of cognition, categorization and meaning proceeds. How does the use of words change their meaning while maintaining stability of meaning for interpretation and meaningful discourse? Are there ‘levels’ of change, with ‘minor change’ that leads on, somehow, to ‘large’ or wider ‘structural’ change? How would that work? What happens in the brain in doing that? This yields a wide research programme, beyond the present paper.

Exploitation, exploration and cognitive distance

² At a conference on cognition and economics in Great Barrington, US, in 2003.

An important implication of the activity theory of cognition, in the present context, is that while we can make a conceptual distinction between exploitation (practice) and exploration (invention), they build upon each other. Exploration arises from practice, and practice arises from exploration. The question for this paper is whether that happens within or between communities. According to the notion of EC's exploration arises within them. If COP's are mostly exploitation oriented, could exploration arise from interaction between them? How could that work? If organizations must somehow be involved, within the organization or in interaction with other organizations, in both exploitation, to survive in the short term, and exploration, to survive in the long term, how is that combination to be achieved?

Nooteboom (2000) proposed a 'heuristic of discovery', by which exploration and exploitation arise from each other in a series of stages or different levels of learning. In learning for exploitation, inventions from exploration converge on dominant technical and organizational designs. To move towards new exploration, such dominant practice needs to be subjected to novel challenges, in novel contexts of application, in a stage of 'generalisation', needed to yield the motivation and the insight needed for change. When change is needed, to survive in novel conditions, it is typically first sought in 'proximate' change, to maintain exploitation as much as possible, by novel selections from existing repertoires of action, in the stage of 'differentiation'. When that does not suffice, more radical change is typically sought in the attempt to build in elements from newly encountered 'foreign' practices, in the new context of application, that appear to be successful where one's own practice appears to fail, in the stage of reciprocation or hybridization. This typically yields hybrids that are inefficient, or even inconsistent, but yield an opportunity to experiment and explore the potential of novel elements. When such potential emerges, it yields a motivation for more radical of principles of design, principles or logic, and an indication of where that is to be sought, to realize emerging potential of novelty and to eliminate the inconsistencies or inefficiencies of the hybrid, in the stage of transformation or 'accommodation'. Bogenrieder & Nooteboom (2004b) applied the analysis to the 'emergence of learning communities'. Here, I go back one step to analyse the relationship between exploitation, exploration and cognitive distance.

As a result of differences in physical and cultural environments that are embodied in cognition, the perception, interpretation and evaluation by people are path-dependent and idiosyncratic to a greater or lesser extent. By path-dependent I refer, here, to the condition that cognition takes place on the basis of categories that have developed in interaction with a certain context of action, so that the latter predisposes cognition. Cognition depends, literally, on the path of cognitive development. Different people see the world differently to the extent that they have developed in different social and physical surroundings and have not interacted with each other. In other words, past experience determines 'absorptive capacity' (Cohen & Levinthal 1990). This yields what I call 'cognitive distance' (Nooteboom 1992, 1999).

Cognitive distance between people, resulting from variety of experience, presents both a problem and an opportunity. The opportunity is that variety of cognition is a source of innovation. The problem is that to the extent that cognition differs, it is more difficult to understand each other and to collaborate and utilize opportunities from cognitive variety. Note that, cognition being a wide concept in this paper, cognitive distance entails both difference in intellectual knowledge and difference in feeling and

morality. Cognitive distance yields not only a difficulty of mutual understanding, or limit to absorptive capacity (Cohen & Levinthal 1990), but a wider difficulty of collaboration, including a mismatch of moral and motivational aspects of collaboration. In other words: distance includes issues of both competence and governance.

Optimal collaboration requires a trade-off between the upside and the downside of cognitive distance, seeking an 'optimal cognitive distance', large enough to offer variety for innovation, and small enough to enable collaboration. This is illustrated in Figure 1.

Figure 1 about here

If ability to collaborate declines with cognitive distance, say linearly, and novelty value increases with it, say linearly, and performance is proportional to the mathematical product of the two (potential x ability to utilize it), then performance is an inverted-U shaped function of distance, yielding some optimal distance. Now for exploitation (Figure 1b), which is oriented towards efficiency, in a fine tuning of complementary capabilities, where lack of error or mismatch is more important than novelty, the marginal utility of novelty is less (lower positive slope of the novelty line) than for exploration (Figure 1a), which is oriented at more radical novel combinations, and the marginal disutility of lack of understanding and ability to collaborate is greater (higher negative slope of the ability line). As a result, as illustrated in Figure 1, optimal cognitive distance is lower for exploitation than for exploration. In exploration cognitive distance has more relative advantage. This also illustrates the problem of combining exploitation and exploration in a single organizational unit: there is a tension between the needs for small and for large cognitive distance at the same time. We might now interpret Figure 1b as belonging to COP's and Figure 1a as belonging to EC's.

One way to solve the problem of combining exploitation and exploration in one community is to specialize in either of the two, in a given community, and engage in collaboration with another community that specializes in the other. On the firm level, a classic example of this is that of small biotechnology firms that focus on the exploration of novel active substances or processes and then transfer the outcome to large pharmaceutical companies for its exploitation. However, there may be an alternative of combining different COP's for the sake of exploration on the basis of cognitive distance between them. Or, in other words, could it be that several COP's together may constitute a larger EC? But what is the meaning of cognitive distance if we shift from distance between individuals and distance between communities, or organizations?

Exploration by interaction between communities

Nooteboom et al (2006) applied the notion of optimal cognitive distance to collaboration between firms, in an attempt at an empirical test of the thesis of optimal cognitive distance. The hypothesis was that Figure 1 also applies on the level of organizations, in terms of cognitive distance between them. In that study, cognitive distance between firms was operationalised in terms of the dissimilarity between technology profiles of the firms

involved, derived from patent data: profiles that arise on the basis of the incidence of a firms in (some 300) different patent classes. The hypothesis was that innovative performance (in terms of patent production) between firms was an inverse U-shaped function of such distance, and the hypothesis was corroborated on a data set of alliances between 116 firms in a period of twelve years.

That is not an unreasonable move, but how satisfactory is it to construct cognitive distance between groups in terms of the difference in the *collective* knowledge of those groups? An alternative would be to look at the difference in *individual* knowledge of those people from the different groups that actually interact in collaboration between those groups, i.e. the ‘boundary spanners’ between those groups? They may have limited distance between them and considerable distance to the other people in their respective groups. That distance is likely to be smaller than the distance in collective knowledge of the groups. To fulfill their role, boundary spanners must have an exceptionally large absorptive capacity, or ability to collaborate, in order to collaborate with both people within their own group and the boundary spanner of the connecting group. Boundary spanning is a delicate job. The boundary spanner’s loyalty to his own group may be in doubt for the very reason that he is able to empathize with outsiders. He may be seen to engage in *illegitimate* peripheral participation. In the empirical study of Nooteboom et al. such use of cognitive distance between boundary spanners rather than groups overall was not available in the data.

The following questions arise. How could boundary spanning between COP’s yield exploration? Are there any reasons why this should happen between communities within rather than between separate organizations? What is the identity of communities and organizations by which cognitive distance gets limited, not to exceed its maximum?

For an answer to the first question I turn to the ‘logic of discovery’ according to Nooteboom (2000) and summarized above. Collaboration across (greater or smaller) cognitive distance forces one to try and apply one’s knowledge in a novel context, in this case the practice of the partner (generalisation). There, one is faced with limitations in one’s own view and competence, and the need to adapt. The first step would be to try and adapt by differentiating one’s view according to existing repertoires of knowledge and competence (differentiation). If that is not sufficient, further interaction may yield the perception that one may try to adopt elements of what the partner is doing, which seem to function better than some elements of one’s own practice, in experimentation with a hybrid (reciprocation). This, then, yields both the opportunity to explore the potential of novel elements and insight into where inefficiencies and in the hybrid lie, as well as obstacles to the realization of the emerging potential of novelty, which provides both the incentive and some direction for a more radical change of principles of logic or design (accommodation). Note that what is different here from the original logic is that the process now is reciprocal. Partners can help each other in fitting in elements from their practice into hybridization of the partner’s practice, trying to explain how it works, with clever use of metaphors, examples, mental experiments or simulation. Next, they can try to jointly find novel design principles for a synthesis, in a new form.

From the process we can also derive other requirements for boundary spanning. One is that in the process of differentiation the boundary spanner has to liaise back to his own community to find new options from existing repertoires. This will be needed not only for reasons of competence but also for reasons for governance, in particular motivational

reasons. The next stage of hybridization, with its attendant inefficiencies and possible inconsistencies, will hardly be popular with community members unless they have first had the opportunity to exhaust alternatives from their existing repertoires. In the more radical, fundamental change of basic design principles they will not be willing to go along unless they have experienced the benefits of the potential of novelty that is becoming manifest. Soon this process will go beyond the capacity and capability of any single boundary spanning, and the process is likely to be complemented with taskforces and exchange of personnel between the partner communities, when its potential becomes manifest. At every step the peripherality of participation will have to be legitimated.

Organizational focus

On the basis of the activity based, social constructivist view of cognition, the literature on management and organization has developed the view that firms construct their own, more or less organization-specific meanings and interpretations, in the organization as a system of 'sense-making' (Weick 1995), 'collective mind' (Weick and Roberts 1993), system of 'shared meanings' (Smircich 1983), 'interpretation system' (Choo 1998), or a cognitive 'focusing device' (Nooteboom 2000).

In the present context, a cognitive focus, in the wide sense of including both substantive understanding (on the competence side) and morality (on the governance side), is needed, in communities and organizations, to limit cognitive distance from going beyond the optimum, given the orientation towards exploitation or exploration. Such focus is achieved on the basis of specialized semiotic systems, in language, symbols, metaphors, myths, and rituals. This is what we call organizational culture. Within communities focus is narrower, and culture tighter, than between communities within an organization. Organizational focus may be compared to the 'habitus' of an organization or community (Mutch 2003, Bourdieu 1986, 1990).

On the competence side, focus is needed to *enable* people to understand each other and connect complementary knowledge, without unduly restricting variety and creativity. How far variety (cognitive distance) is needed depends on orientation towards exploitation or exploration. On the governance side, focus is needed to *motivate* people to collaborate and share and connect knowledge, without unduly restricting autonomy, ambition and competitive spirit. Governance is needed to control 'relational risk', within and between communities and organizations. Here, I distinguish three kinds of risk. One is risk of (particularly one-sided) dependence, which is close to the 'hold-up risk' of transaction cost theory. One cause of that risk may be the relation-specific investment one has to make in order to make the relationship work, e.g. to achieve mutual understanding and trust. One will make such investment only when confident that one will recoup it in the relationship. A second risk is that of competition due to knowledge spillover: in collaboration for learning partners may run off with the knowledge one gives in order to compete, in profits, bonuses or career prospects. A third risk is that of psychological safety (Edmonson 1999): one may be hesitant to show ignorance or lack of competence, for the loss of prestige and reputation that may yield. Such loss may also have negative effects on prospects for career and future partnerships.

Organizational focus also has a function of both selection and adaptation. In selection, it selects people, in recruitment but often on the basis of self-selection of personnel joining the organization because they feel affinity with it, and adaptation, in the socialization into the firm, and training, of incoming personnel. In between entry and socialization lies 'peripheral participation'. To perform these functions, focus must be embodied in some visible form. Such form is needed for several reasons. One is to function as a signaling device to outsiders. That is needed as a basis of the (self)selection process of incoming staff, and for recognition and identification by other stakeholders, such as colleagues, customers and suppliers. More for the internal function of coordination, we find the exemplary behaviour of organizational heroes, corresponding myths, war stories and rituals.

This cognitive theory of the firm can be contrasted with earlier, contractual theories in economics (Alchian & Demsetz 1972, Williamson 1975, 1985, Hart 1995). The latter look at organizations as systems of contracts or material incentives, to control opportunism. However, increasingly it has been recognized that for a variety of reasons ex-ante incentive design is problematic. Due to uncertainty concerning contingencies of collaboration, and limited opportunities for monitoring, ex ante measures of governance are seldom complete, and need to be supplemented with ex-post adaptation. Such uncertainties proliferate under present conditions of professional work and rapid innovation. Professional work is hard to monitor and evaluate, and requires considerable autonomy for its execution. Rapid innovation increases uncertainty of contingencies and makes formal governance, especially governance by contract, difficult to specify. If such specification is nevertheless undertaken, it threatens to form a straightjacket that constrains the scope for innovation (Nooteboom 1999). Furthermore, the attempt to use contracts to constrain opportunism tends to evoke mistrust that is retaliated by mistrust, while in view of uncertainty there is a need to operate on trust more than on contract (Nooteboom 2002). Organizational focus, provided by organizational culture, yields an epistemological and normative 'background' for ex-ante selection of staff to suit organizational focus, and for ex-post adaptation, as a basis for coordination, mutual understanding, mutual adaptation, decision-making, and conflict resolution.

Details and differences of focus

The question will arise what, more precisely, the difference is between cognitive focus on the level of a community and on the level of an organization with several communities. I indicated before that within communities focus is narrower, and culture tighter, than between communities within an organization. What does that mean, more precisely?

Both inside and outside organizations, people have more goals, capabilities, roles and relations than those that are governed by organizational focus (Dimaggio 1997). Ring & van de Ven (1994) made a distinction between organizational roles people play and their behaviour 'qua persona'. This was presaged by the distinction Simmel (1950[1917]) made between a person's function in an organization, which takes up only part of his personality, and his full personality. So, one question is how far organizational focus reaches in affecting actions of people. Berger & Luckmann (1966) distinguished between

primary socialization in family, as one grows up, and, building on that and molding it further, secondary socialization in places of work.

The content and extent of cognitive alignment in organizations varies. In addition to the distinction between the competence and governance sides of focus, there are five dimensions for both. First, there is *width*, i.e. the range of different areas of competence and governance in a firm to which focus applies. This depends on the range of capabilities that a firm encompasses. Second, there is *reach*, i.e. the number of aspects within each area covered by the focus. Does it affect all or only some key aspects of a given capability? A third dimension is *tightness* versus *looseness*, i.e. narrowness of tolerance levels of standards or rules imposed by focus, versus allowance for slack and ambiguity, with improvised, unforeseen meanings, actions, etc. For exploitation focus needs to be tighter, and for exploration more loose.

Fourth, focus may have different *content*. In particular, on the governance side it may entail formal, i.e. depersonalized, norms of legitimacy, which regulate what managers and workers can legitimately do and can expect from each other. Such norms render relations more impersonal and thereby reduce tensions associated with the exercise of personal power, and they enlist workers to participate in the control of their colleagues (Scott 1992: 306). The content of focus may also be more cultural, in the sense of offering guidance by more emotion-laden underlying values, expressed in symbolic entities, behaviours, events or processes. The two types of content are related, since norms of legitimacy may be expressed culturally. One can have norms of legitimacy that are specified rigorously and formally, and one can have more informal, ambiguous, cultural features that go beyond norms of legitimacy. The first occurs more in exploitation and the second more in exploration.

Fifth, and this will turn out to be a central point, focus may relate to *surface regulations* concerning specific actions or to underlying more fundamental notions, in a *deep structure* of logic, principles or cognitive categories that form the basis for surface regulation. A surface rule or regulation allows for a certain range of activities; a deep structure allows for a range of surface regulations. Simon (1976) already acknowledged that an organization controls not decisions but their premises. Nelson & Winter (1982) made a similar distinction, between routines and 'meta-routines' that guide the development of routines. Schein (1985) made a similar distinction in organizational culture. Below surface features such as specific rules, practices, symbols, myths, rituals, at the basis of organizational culture lie fundamental views and intuitions regarding the relation between the firm and its environment ('locus of control': is the firm master or victim of its environment), attitude to risk, the nature of knowledge (objective or constructed), the nature of man (loyal and trustworthy/self-interested or opportunistic), the position of man (individualistic or part of a community), and relations between people (rivalrous or collaborative), which inform content and process of strategy, organizational structure, and styles of decision-making and coordination. Schein also allowed for an intermediate level, connecting the fundamental cognitive categories with the surface level of specific structures and rules, in the form of general principles that express fundamental cognitive categories but are yet general and generic rather than specific to certain activities and contexts.

The difference between activities, surface regulation and deep structure is schematically illustrated in Figure 2. Here, for simplicity of exposition, the intermediate

level of culture is left out. A given surface regulation enables a bundle of potential actions. An underlying cognitive category in deep level structure enables a bundle of surface level regulation. The establishment of coordination on the surface level (routines, if one wants to use that term) leaves freedom for variety of underlying cognitive categories, but has to be set up ad hoc each time, and requires the solution of complications due to differences in underlying cognition. The establishment of coordination on the deep level yields more ex ante agreement for setting up surface regulation, and thus enhances flexibility and speed of action, but it reduces variety of cognition on the deep level. It entails more indoctrination. Thus efficient exploitation is enhanced by deep level coordination, and exploration is constrained by it.

Figure 2 about here

I will argue that organizations serve especially to coordinate on the deep level, with an advantage of easier and faster understanding and agreement, to enable exploitation, while collaboration between organizations operates more on the surface level, with the advantage of greater variety on the deep level, allowing for a wider scope of exploration. Organizational focus entails a certain myopia, which can be compensated with external relationships between firms, at greater cognitive distance. Here, the theory of the firm includes a theory of inter-firm relationships.

The notion of cognitive distance entails a distinction between reducing and crossing cognitive distance. Reducing cognitive distance entails alignment on the deep level of cognition, so that people think more similarly. Crossing cognitive distance entails making surface agreements while maintaining differences on the deep level, with people continuing to think differently. When people who think differently continue interaction, starting from surface agreements, they may in time come to think more similarly, i.e. share underlying cognition, in a reduction of cognitive distance.

Why communities within organizations?

If COP's are needed primarily for efficient exploitation, and exploration can take place in EC's, or in interaction between COP's, why have organizations that consist of more than one community? Why not have one organization or firm per community? In other words, what is the difference in cognitive focus between a community and an organization or firm? I propose that this has to do with the difference between the competence and governance sides of cognitive distance and organizational focus.

Very briefly and schematically, I propose that firms allow for considerable (but still limited) internal distance in competence between communities, while they limit distance in governance, on the basis of a certain style or 'habitus' on the moral side of collaboration, across a variety of contents of knowledge. Within COP's, distance is small in both competence and governance. The advantage of this, compared to collaboration between different organizations, is that collaboration across different competencies, located in different COP's, for the sake of exploration, can be set up quickly and

relatively smoothly, compared to the problems of aligning interests and styles of collaboration across different organizations that differ more on the moral side. By contrast, within professional communities (PC's), extending across different organizations, there is limited distance on the competence side but considerable distance on the governance side. Between professionals there is easy understanding but not necessarily ease of collaboration. In other words, organizations combine variety in competence with some unity in governance, while in professions it is the other way around.

Next, I try to specify differences between organizations, COP's, EC's and PC's in more detail, in terms of the features of cognitive focus. This is summarized in Table 1.

Table 1 about here

According to Table 1, I propose that in organizations cognitive distance is limited in competence, allowing for some variety of potentially complementary competencies, and small in governance, with a cognitive focus that applies mostly to a limited range of moral categories (reach), but on a deep level of basic values, often with partly formal and partly informal (symbolic) features. In epistemic communities (EC's), distance is limited in competence, aiming for variety but also complementarity, but they build on limited cognitive distance in governance, offered by organizational culture, and have limited, informal and loose reach of aspects of behaviour, little depth of focus on top of that provided by the organization, and only some additional surface regulations. In communities of practice (COP's), distance is small in both competence and governance, cognitive focus has a wide, pretty tight, typically informal reach, with considerable deep structure in addition to that provided by the organization. In PC's, across organizations, distance is small in competence, large in governance, and there is little reach of focus, but it is pretty tight and deep, in fundamental substantive principles or paradigms of the profession.

Together, these forms of organization are highly complementary, and together enable a system of exploitation and exploration that can be highly efficient. Organizations yield some variety of internal competence, though this is limited by the potential complementarity of competencies, with communities of practice for efficient exploitation, epistemic communities and interaction between different communities of practice as sources of exploration, building on a relative ease of collaboration on the governance focus offered by the organization. Organizational focus by definition yields some organizational myopia, which limits exploration and innovation, but this can be compensated by inter-organizational collaboration, at larger cognitive distance, although there more time is needed to set up surface regulation, or to develop some shared deep-level categories to facilitate collaboration. PC's across organizations serve to deepen professional expertise, in an exchange of experience across a variety of contexts of application.

Note that in the latter we see a re-appearance of the 'logic of discovery' that was summarized before. When professionals get together to compare experience in different contexts of application, this yields a setting for 'generalization' that through

‘differentiation’ and ‘reciprocation’ may yield renewal and ultimately revolutionary change in the profession, although for the latter one may need novel combinations between different disciplines.

Conclusions and further research

The differences and relations between different kinds of community, in particular communities of practice (COP’s) and epistemic communities (EC’s), and the organization of which they may form a part, can be clarified on the basis of the activity based theory of knowledge that is commonly used in the literature. That theory yields the notion of cognitive distance, and the trade-off between its advantage for novelty and its disadvantage in limited ability to collaborate. This yields the notion of optimal cognitive distance in a community, and the difference between between COP’s and EC’s. In organizations and communities, cognitive distance is limited by ‘cognitive focus’.

Cognitive distance and organizational focus have a competence side, in substantive knowledge, and a governance side, in morality, i.e. norms and values of conduct. Exploitation takes place in COP’s. Exploration may take place in EC’s or in interaction between COP’s, within and between organizations.

The way in which interaction between individuals and communities at a cognitive distance yields exploration can be understood from a ‘logic’ or heuristic of learning, with different stages, derived from earlier research. This has implications for the roles of boundary spanners that bridge the cognitive distance between communities. Further details concerning levels of change in the interaction between communities, see Bogenrieder & Nootboom (2004b).

While Table 1 applies to cognitive distance and relationships within communities, one can do a similar analysis concerning distance and relations between communities, as Cohendet (2005) did, and some of logic developed here can be used to do extend that analysis. However, that goes beyond the limits of the present paper.

A central point of the present analysis is the following. There is a cognitive division of labour between communities and organizations. Within organizations there is some but limited distance in competence, and small distance in governance. In COP’s there is small distance in both competence and governance. In EC’s there is small distance in governance and some distance in competence. In PC’s there is small distance in competence and large distance in governance. Exploration in interaction between COP’s within an organization is facilitated by shared organizational focus in governance, but limited by the limited cognitive distance within an organization. The potential for exploration is larger between organizations, at larger cognitive distance, in both competence and governance, but requires more time and effort to set up and regulate collaboration. PC’s enable professional development to tap into the diversity of application across organizations. Employing the potential of their cognitive complementarity, these different forms of organization can together yield efficient systems of exploitation and exploration.

Next to the effects of cognitive distance, there is analysis to be done of the effects of the structure, strength and content of ties on novelty value and ability to collaborate. This will yield further insight into organizational structure, in the configuration of people in

communities, and of communities in organizations, and their effects on exploitation and exploration. That goes beyond the present paper, but for analysis and empirical tests for relationships between organizations, see Gilsing et al. (2006).

The distinction between COP, EC and PC is very schematic. In fact there is a greater variety of groups for learning or development, as demonstrated by Bogenrieder & Nooteboom (2004a). They used criteria of different kinds to categorize what, to avoid confusion, they called 'learning groups' rather 'communities'. The structure, strength and content of ties form part of those criteria. Structure has six dimensions and strength five. One dimension of strength is the frequency with which members meet and another is how long membership lasts. Content includes the subject of knowledge (technical, commercial, organizational), the type of knowledge in terms of tacit or more codified knowledge, and the level of learning, i.e. exploitation or exploration, involved. In addition, there are different types of relational risk (of dependence, competition, and psychological safety, cf. Edmonson 1999) and different instruments of governance to deal with them. By configuring these features in different ways one can generate a vast number of different potential kinds of learning groups.

Empirically, they found five groups. One was characterized as a project team, and had some similarity to the notion of a COP. One aspect where it differed was that since the group was oriented at temporary projects, membership was shorter than one would expect for a COP. None of the groups could be recognized as an EC, in the sense of being engaged in exploration of novel products or processes. Two groups seemed like PC's, but in different ways. One was aimed at the development of professional expertise, among members of the same profession, but all within the same organization, and the other was aimed at the development of behavioural and managerial skills among people from different professions, within the organization. This indicates that while in the discussion of communities we are inclined to think of technical expertise and skill, learning may be oriented also towards behavioural and organizational skills. The innovation literature used to have a similar bias towards technological innovation, but has learned to also look at organizational innovation. A fourth group was aimed at improvement of projects by exchange of experience from different projects. That group failed because the projects involved were too diverse, and required too much explanation of specific contents and conditions of projects before mutual understanding was established, with difficulties in codifying the tacit knowledge involved in the projects, and the stability of membership was too low to solve problems of psychological safety. This illustrates that in connecting different project teams or COP's one must take the time to develop mutual absorptive capacity. This entails a specific investment in the sense of transaction cost theory, with the implication that the relationship must be expected to last sufficiently long to make that investment worth while. The group transformed itself into a group that was purely oriented at the exchange of location knowledge (Hutchins & Klausen 1996, Moreland 1999). Having established where interesting projects take place, people can contact them to develop a more intensive, durable and psychologically safer relationship needed for mutual learning. Another group with a similar objective of project improvement was successful by replacing accounts of real projects by stylized, virtual cases that required less investment in attention up front and solved the problem of psychological safety.

My conclusion is that the notion of EC's should be widened to include a wider variety of learning groups, and that the notion of PC's should be widened to allow for exchange

of behavioural, organizational or managerial professional competence next to more technical professional expertise. As a result, the analysis of the total system of exploitation and exploration will include a greater variety of learning groups, with a richer analysis of dimensions of cognitive distance and cognitive focus than provided in Table 1. However, the basic logic will still apply that the advantage of having such groups within an organization is that on the basis of organizational focus in governance they can be set up more easily than between different organizations. The disadvantage is that cognitive distance remains limited, yielding myopia, and outside relationships are needed to repair for that, at the price of more time and costs in setting them up.

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Figure 1 Exploitation and exploration

Figure 1a Exploration

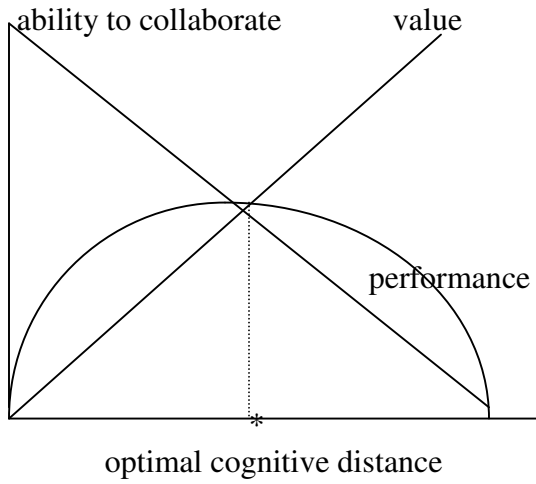


Figure 1b Exploitation

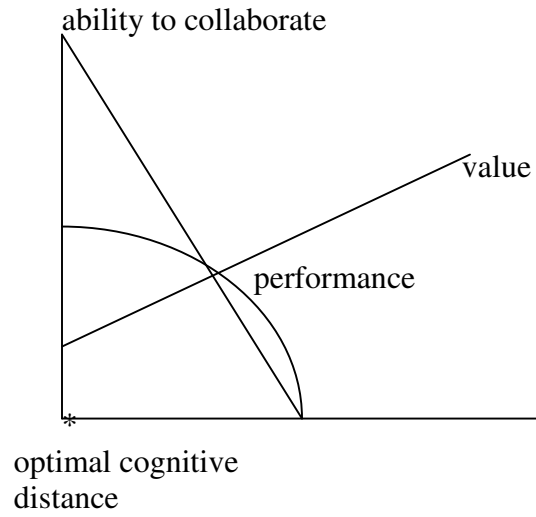


Figure 2 Levels of coordination

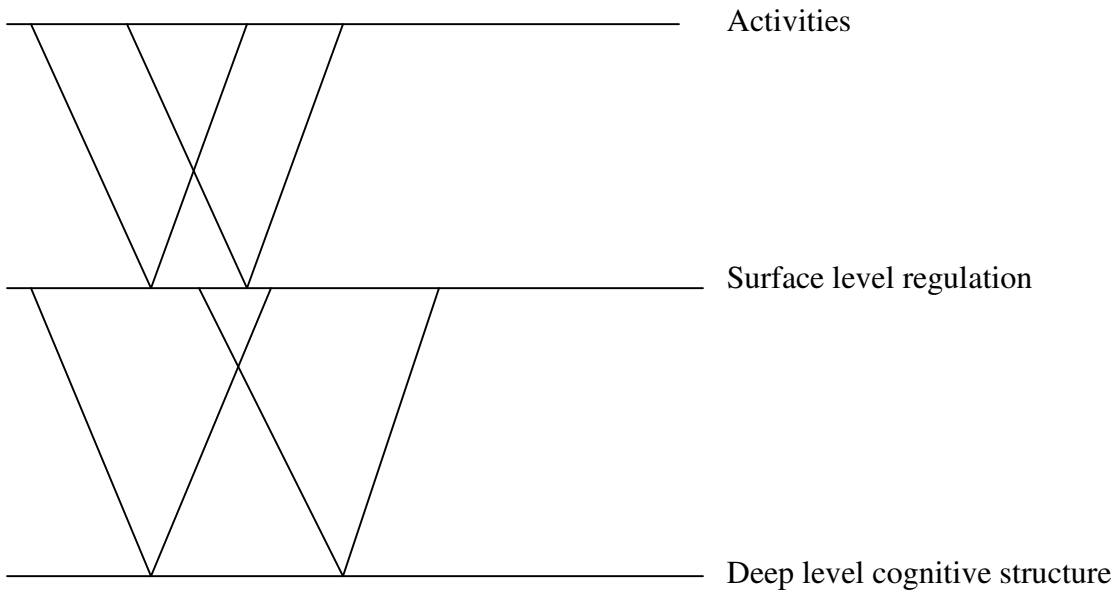


Table 1 Organizations, COP's, EC's and PC's

| | Organizations | EC's | COP's | PC's |
|---------------------------------------|---------------|-----------|----------|--------------------|
| cognitive distance in competence | limited | limited | small | small |
| in governance | small | small | small | large |
| Characteristics of cognitive focus | | | | |
| reach | small | limited | wide | small |
| tightness | large | small | large | large |
| content | fairly formal | in formal | informal | formal or informal |
| surface/deep level | deep | surface | deep | deep |