Communicative routines in distributed cognitive systems: the integration of epistemic diversity

Irma Bogenrieder

Rotterdam School of Management
Erasmus University, The Netherlands
ibogenrieder@fbk.eur.nl

Abstract

Since the importance of multifunctional teams is recognized there is an ongoing discussion how diverse knowledge of the functional specialists should be integrated. The theoretical proposals for integration convey theories of pure coordination to theories that propose transspecialists who can 'dock' into the diverse (specialist) knowledges. In this paper, none of these two proposals is considered a viable way. Instead, I start with the assumption that a multifunctional team is to be considered a distributed cognitive system that should develop into a script-like organization. Knowing each other and integrating knowledge is considered as speech act where language use also has a social signalling function. From here, I propose communication patterns that expand the validity of the locally shared (mutual) knowledge. Communication patterns are basic functions – a type of grammar - in order to support the integration of diverse knowledge from local acceptance to a larger network.

Keywords: epistemic community, speech act theory, communication pattern.

Suggested track:

J. The relationship between individual, team and organizational learning

Introduction

Multifunctional teams currently play an important role in innovative projects and explorative learning. Multifunctional teams in such innovative projects are

characterized by the necessity of cooperation between diverse specialists with their own disciplinary knowledge and disciplinary background. The advantage of using diverse knowledge is currently stressed. However, diversity is not only an advantage but also a problem. Diversity in knowledge often implies diversity in language and jargon and in the applied frames of reference as well (Boland and Tenkasi, 1995). Even diversity in life worlds is identified (Dougherty 1990). In order to avoid a semantic jungle, I will refer to all these differences as differences in belief systems. These differences have as a result that various specialists may interpret a problem or task in various ways. Also the criteria for the solution of a problem may be different between specialists. Differences between specialists in a multifunctional team, thus, cannot only be interpreted as cognitive differences in knowledge but are more fundamental.

Recently, epistemic communities are suggested as a platform for innovative, explorative learning that make use of the various specialists' belief systems. They are defined as "a network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy relevant knowledge within a domain or issue area (…). This network has (1) a shared set of normative and principled beliefs, which provide a value based rationale for the social action of community members; (2) shared causal beliefs, which are derived from their analysis of practices leading to a central set of problems in their domains and which then serve as the basis for elucidating the multiple linkages between possible actions and desired outcomes (3) shared notions of validity – that is intersubjective, internally defined criteria for weighting and validating knowledge in the domain of their expertise; and (4) a common policy enterprise – that is a set of common practices associated with a set of problems to which professional competence is directed" (Haas 1992:3). This quotation nicely illustrates that members in epistemic communities already must have some criteria in common in order to cooperate. Thus, again, it is not only cognitive difference that makes a difference between specialists but other features as well.

However, is it really realistic to assume that members of an epistemic community or a multifunctional team already have some features – such as validation critieria - in common ex ante? Shouldn't a common belief system better be conceptualized as the result of cooperative processes instead assumed as starting point of cooperation? Tsoukas (1996) argues in this way.

Next to these there is still another criticism. Do we really need general (for the whole epistemic community valid) validation criteria? Or is it sufficient if specific members agree on shared validation criteria concerning a specific problem? In other words: how 'broad' and 'generalizable' do the validation criteria have to be? However, when

specialists do not agree on validation criteria how can they coordinate their activities and cooperate in order to solve an (innovative) task? Coordination is generally understood as dealing with task dependencies that originate in specialization and division of labor (Grant, 1996; Crowston, 1997). In earlier writings coordination is often understood as agreement on time, place and sequence of activities ('sequencing and scheduling activites' – Hoopes and Postrel 1997). Nowadays, this mechanistic concept of coordination is questioned. It is assumed that in order to coordinate complex and ambiguous tasks some shared meaning of the task and goal is necessary (Klimosky and Mohammed, 1994). Underlying these processes group members should have a common knowledge base, e.g. mutual knowledge (Cramton, 2001), shared mental models (Klimosky and Mohammed, 1994) or a shared representation of the distribution of tasks (Weick and Roberts, 1993). For purposes of clarity, I will call these newer insights 'cooperation.' The problem is that in explorative learning variance seeking behavior is necessary. A clear and common goal definition cannot serve as 'focusing device' as it is not yet existing in innovative projects (McGrath, 2001). And, as already argued, common or mutual knowledge might not exist in advance. Thus, cooperation might be difficult as there is not (yet) a common interpretation of the task and goal; nevertheless, pure coordination is also falling short because there is not (yet) an overview how activities should be scheduled and sequenced. Here lies the difference with the notion of 'collective mind' by Weick and Roberts (1993) where the authors state that cooperation consists of processes of representation, contribution and subordination. In epistemic communities, as they are developing, the question is contributing and subordinating to what? Representation of what?

The question thus remains how to cooperate activities in an epistemic community without having a common understanding of the problem and the goal and without common validation criteria. The paper proceeds in the following way: First, I will introduce various notions of groups that are considered important for explorative learning and that make use of diverse knowledge. The most important types of groups for explorative learning are epistemic community (Haas 1992) and the notion of transactive memory (Wegner et al. 1991). I will discuss the assumptions about cooperation that is built into these two concepts. Whereas both concepts differ in their assumption about cooperation, both types acknowledge the principle of distributed cognition (Hutchins 1999). The main question then is how cooperation takes place in a distributed cognitive system. In such a system, common validation criteria cannot be assumed ex ante; neither can be assumed that there already exists a group shared

mental model that could facilitate coordination (Klimosky and Mohammed, 1994). As a consequence, it must still be explained how a system of distributed cognition develops from an aggregation of individualized specialists. In this paper, I suggest that joint speech acts are the basic building block from which mutual or common knowledge is built out of the diverse knowledge-contributions and where roles and tasks are defined in local interaction. Consecutively, this mutual knowledge is spread through the network of specialists. These patterns serve to interpret behavior and establish meaning. When such patterns are established a group has developed common knowledge about itself similar to group mental model. We do not know very well how such patterns develop. I therefore suggest the use of speech act theory and triadic processes in order to explain the development of communication patterns. In this way I want to explain how diverse specialists cooperate in a self-designing and distributed way.

Groups as systems of distributed cognition for explorative learning

It was already argued that the notion of epistemic community makes the assumption that people already must have some features in common in order to cooperate in innovative projects. This assumption is refused and it is suggested that such features should better be conceptualized as an outcome of a cooperative process than as input. The causality should be exactly the other way round than it is suggested in epistemic communities. However, the notion of epistemic community makes clear that people should have some criteria in common and should not dig into or learn each others' knowledge. Thus, for cooperation it is not necessary to increase 'trans-specialist understanding' (Postrel 2002) that is defined as: "A team with perfect trans-specialist understanding would have no differentiation of knowledge among its members, but little ability to solve domain-specific problems" (Postrel 2002: 306). The advantages of specialization can be maintained. However, instead of trans-specialist understanding there should exist common criteria for communication and validation (see the definition by Haas 1992). These are, in fact, procedural criteria that lie outside a specialist's (content) domain. They describe how to evaluate and valuate other's contributions. Therefore, a short description of epistemic communities is the acceptance of a common procedural authority (Lissoni 2001) - thus the routine has an authority in itself. This analysis gains an important insight: there is no need to understand each other's knowledge in order to have cooperation. Accepting a common routine how to deal with each other and how to deal with the problem seems to be a satisfying condition for cooperation between diverse specialists.

The notion of transactive memory (Wegner, Giuliano and Hertel 1985) add that insight in shared 'location knowledge' is necessary in order to make cooperation possible. The authors suggest in their model of transactive memory that individuals possess detailed, specialized knowledge. For cooperation, all members must have available shared knowledge about 'location knowledge' – knowledge about who knows what. Furthermore, 'a set of communication processes whereby two minds can work as one' (Wegner, Giuliano and Hertel 1985: 263) is necessary. As intuitively attractive this model might be, the authors do not give any insight how these communication processes take place. For example: does a transactive memory system need shared validation criteria? Does a transactive memory system need a shared mental model or representation? How is knowledge combined?
Nevertheless, both approaches make clear that it is not necessary to have trans-specialist understanding and yet cooperation is possible. Therefore, it is concluded that a multifunctional team can be conceived as a system of distributed cognition: cognitive labor is socially distributed (Hutchins and Klausen 1996:20) and, yet, cooperation is possible.

A distributed cognitive system has as characteristics that (1) the access to information is distributed. Some people get more or different information than others. (2) Storage of this information is also distributed in the system. Furthermore, (3) the system develops "shared expectations that are then the basis of coordinated actions" (Hutchins and Klausen 1996: 22). The case that is discussed by the authors is the crew on an airplane. Admittedly, the crewmembers already have a lot of knowledge in common by their education. Therefore, it is unclear whether 'shared expectations' must be understood as a necessary condition or (again) whether shared expectations are an outcome of a communication process. A fourth (4) characteristic of a distributed system is the development of intersubjective understanding or shared meaning of a situation or problem (Hutchins and Klausen, 1996). Intersubjective meaning is still understood here as a distributed phenomenon. A shared or common representation about the distribution (!) of knowledge and tasks is developed. Intersubjective understanding thus implies that participants construct the same knowledge about the distribution of knowledge in the sense of: 'I know that you know that I know that you do x.' (adopted from Hutchins and Klausen, 1996). It implies the same phenomenon that is described as mutual knowledge (Krauss and Fussell, 1990) or common ground (Clark and Wiles-Gibbs, 1986). It is also similar to representation (Weick and Roberts, 1993) and knowledge about location knowledge (Wegner et al., 1991).

Summing up: The notion of distributed cognition does not imply the necessity of having the same knowledge in common for cooperation being possible. Under the condition of distributed cognition the necessary ingredients for cooperation are, as identified so far, mutual knowledge (intersubjective understanding) about the distribution of knowledge and shared expectations.

Tsoukas (1996) argues that a system of distributed cognition should be viewed as an activity system. He underpins this proposition with the idea that knowledge is embedded in social practice and in a social structure. The implication, then, is that a distributed cognitive system is not only concerned with the distribution of knowledge but also with the distribution of social positions. A distributed system has also a social structure where members hold a certain position and occupy a particular role. Thus, adding to the insights of Hutchins and Klausen (1996) we should recognize a multifunctional team as a social system of distributed cognition.

In order to be more specific in describing such a social distributed cognitive system Bogenrieder and Nooteboom (2003) draw on the notion of a script. “On the level of communities, studied here, nodes in a community script refer to (potential) activities of individuals. Nodes entail ‘repertoires’ of action… which includes knowledge and skills. … In a script, there are direct connections or ‘linkages’ between nodes when their activities are dependent in any way. The linkages that a node has with other nodes define its ‘role’ in the community. Neighbouring nodes, i.e. nodes with direct connections of dependence, exert demands one ach other, which yield constraints on their connections. These constraints define boundaries of the ‘task’ of a node. In other words, a role entails a set of linkages and corresponding tasks.”(Bogenrieder and Nooteboom, 2003). When drawing this parallel it becomes clear that the definition of a role and a task is rooted in the interrelatedness with other agents in a system. More specific, a role is determined by the existence of relationships with others, i.e. the social network structure. A task is determined by the constraints others put on the individual. This is consistent with the description of a social structure by Nadel (1957). He insists that a social role is not defined in itself but by social relationships. Consequently, tasks are defined by expectations that are imposed on a person by others. “More precisely, the individuals expect one another, and are expected by their society, to exhibit the attributes (knowingly and intentionally) as their allotted rights and obligations, entitlements or responsibilities.” (Nadel, 1957: 24).

Here, it can be concluded that the roles and tasks in a social system of distributed cognition are defined by the social relationships. Thus, the differentiation in roles and tasks takes place in interrelatedness with others.

Drawing all these insights together, several processes can be distinguished in a social system of distributed cognition. Communication is the means to make these processes take place.
Communication should serve the following necessary functions in a distributed system:

- negotiating the role of members
- negotiating the task of members
- intersubjective understanding on the distribution of tasks and roles
- spreading mutual knowledge with communication rules

I will now turn to theories of communication in order to indicate how these processes take place in communication. Speech act theory will be used for explaining the definition of roles and tasks. Joint communicative acts as developed by Clark (1996) will be used in order to indicate how mutual knowledge and common ground can be achieved without having the same knowledge. Clark and Wilkes-Gibbs (1986) especially argue that finding a common ground implies the mutual acceptance of the belief that one understands each other and have got an intersubjective understanding. Simmel (1950) and Nadel (1957) will be used in order to explain how mutual knowledge is achieved on a local, distributed basis and how it will spread trough and validated by the larger group.

Speech Act

Speech Act Theory is first proposed by Austin. Speech act theory treats verbal utterances as a type of social interaction. “Speech act makes a linguistic utterance, mainly by virtue of its meaning, the bearer of what would best be called a communicative sense. Notice that a communicative sense belongs to the domain of social interaction and can in general be implemented in various way, among which the use of verbal utterances is the most elaborate and often the most effective one.” (Bierwisch, 1980: 3).

Within speech act theory there is the famous distinction between illocutionary, perlocutionary and propositional acts when using language in context (Austin 1975, Searle et al., 1980). Propositional or locutionary acts are about the true (false) representation of an utterance. They have a referential meaning. Further, "the illocutionary act which has a certain force in saying something; the perlocutionary act which is the achieving of certain effects by saying something."(Austin 1975: 121). An illocutionary act is about the state of the speaker and his intentions. "By performing an illocutionary act a speaker usually expresses also a certain psychological state relating to the propositional content. This psychological state is a function of the nature of the illocutionary force. Thus, for example, a speaker who promises to do something expresses his intention to do it. A speaker who orders expresses his desire that the hearer carries out a certain future action." (Vanderveken, 1980: 256). The distinction between illuctionary and perlocutionary act is not always clear in the philosophical discussion. However, this difficulty is not essential here. In the following I will especially make use of the illocutionary act; however, that use might not always obey the strict philosophical criteria.

What makes speech act theory interesting for communication in a system of distributed cognition is that speech act theory suggests that a speaker does not only communicate propositions but he/she performs an illocutionary or perlocutionary act. Thus, when the speaker and the hearer do not have the same knowledge or belief system, they nevertheless can communicate something else – in the illocutionary act the speaker's intention about his expectation and in the perlocutionary act the intended effect on the hearer.

What matters here, is that speech act theory recognizes that an utterance has next to the locutionary act also an element of social relatedness. An utterance is not only about the content but also about the relationship between persons, e.g. between a speaker and a hearer or between myself as a speaker and myself as a hearer. "The illocutionary point of an apology is to express to the hearer a regret or sorrow for a state of affairs. The illocutionary point of a promise is to commit the speaker to carry out a certain future course of action in the world of the utterance."(Vanderveken 1980: 253). Speech act theory thus recognizes that an utterance is directed towards somebody in a certain way – e.g. as promise, as apology, as order etc. An utterance thus has next to locutionary act the function of relational referring. In Dutch, there is the distinction between 'bedoeling' en 'betekenis'. An illocutionary act, thus, is not only about the literal meaning – 'betekenis'- but also about the 'bedoeling' of an utterance. The speaker thus wants to 'transfer' his intention to a hearer (note: we still do not know

how the hearer might react on the intention). When communicating an intention in the illocutionary act, the speaker constructs a relationship between the speaker and the hearer. In fact, the hearer defines a role for the speaker relative to himself. In an illocutionary act roles are defined for the speaker and the hearer. In this way, it can be confirmed that 'cognitive labor is socially distributed' (Hutchins and Klausen, 1996: 19)

When I express an order I express my expectation or my desire that the hearer carries out my orders (illocutionary act). Accordingly, I define myself in the role of the order-giver (???) and I put the hearer in the role of order taker. In the illocutionary act, I define the type of interrelatedness towards each other – the roles. The locutionary act, then, defines the content of the task for the hearer in the (expected) role. Perlocutionary acts are defined as 'my acts in getting the other to do what he understands that I meant.' (Clark, 1996: 133). In the perlocutionary act I express a (my) pressure on the hearer to fulfill the task. In fact, the perlocutionary act is related to the intensity of expectations that the other does what I want him to do. It is about the intended effect of the speaker.

In the comparison of an epistemic community to a script, first, roles and tasks have to be defined. Speech act theory explains how roles and tasks are determined through communication. Note that, so far, this is only explained on a very local scale and only from the perspective from the speaker. However, speech act theory makes clear that next to the content, there is also a signaling function in communication.

Intersubjective understanding on the distribution of tasks and roles

Considering an epistemic community as a distributed system suggests that there must – on a local basis and for a specific task – common understanding of the task or problem situation. Participants must build up a shared or - better - intersubjective meaning and not only the distribution of labor and roles. The problem is, however, how intersubjective understanding can be constructed given the diverse knowledge backgrounds of the participants. Hutchins and Klausen (1996) state in their analyses of pilots in the cockpit: Certainly, the pilots entered this situation with a considerable amount of shared prior knowledge about how things are supposed to go or how they typically go. … In the course of their interaction, they use that shared knowledge as a resource to negotiate or construct a shared understanding of their particular situation." (Hutchins and Klausen, 1996: 23). The authors claim that intersubjective meanings

have to be constructed only under specific conditions, namely that the expected (normal) course of action is disturbed.

Intersubjective meaning is defined by these authors in the following way: “I know that you know that I know that you should respond.” (Hutchins and Klausen, 1996: 24). It should be clear that intersubjectivity consists of two parts: the same bit of knowledge and the well-known distribution of this knowledge. Intersubjective meaning is similar with what Cramton (2001) defines as mutual knowledge: In each case, mutual knowledge consists not only of the information itself but also the awareness that the other knows it.” (Cramton, 2001: 347). In other words: “Mutual knowledge is knowledge that the communicating parties both share and know they share.” (Krauss and Fussell, 1990: 112). Krauss and Fussell (1990) argue that in the knowledge transfer view of communication, there always must be a common knowledge basis on which mutual knowledge can be constructed (otherwise this would lead to an infinite regress; see Clark and Marshall, 1981).

Clark (1996) and Clark and Marshall (1981) argue that communication exactly serves the purpose of building mutual knowledge. Clark (1996) insists that speech act theory has to include a speaker and a hearer. Instead of just analyzing the speech act of the speaker the joint act between speaker and hearer should be analyzed.

It is within this communication that people try to establish a mutual belief that they understand each other well enough. There is no need to assume that there already exists a common understanding ex ante. “The claim is this: Every presentation enacts the collateral question “Do you understand what I mean by this?” The very act of directing an utterance to a respondent is a signal that means “Are you hearing, identifying, and understanding this now?” This is one goal of the presentation phase, and one goal of the acceptance phase is to take up that question. Respondents complete the joint project immediately when they answer or imply “yes”: they alter it when they initiate a repair sequence that implies “no”.” (Clark, 1996: 243). Clark and Marshall (1981) argue, that although finding mutual knowledge is logically an indefinite process, people are nevertheless able to find mutual knowledge in seconds. Thus, they argue mutual knowledge must be conceptualized in a different way. Mutual knowledge should be grounded in the *shared belief* that they have succeeded in understanding each other: “The participants in a joint action try to establish the mutual belief that they have succeeded well enough for current purposes.” (Clark, 1996: 226). Clark and Wilkes-Gibbs (1986) argue that this mutual or shared belief is established through an acceptance process. This acceptance process makes the indefinite regress definite. The acceptance process is based on the principle of mutual responsibility in

conversation which says: “The participants in a conversation try to establish, roughly by the initiation of each new contribution, the mutual belief that the listeners have understood what the speaker meant in the last utterance to a criterion sufficient for current purposes.”(Clark and Wilkes-Gibbs, 1986: 33). Thus, the authors assume that participants can achieve a common belief (that they have understood each other) through the course of the conversation. Mutual knowledge as defined above is now changed in a mutually accepted belief that there exists mutual knowledge. The way how cooperation takes place in a conversation makes participants adopting the belief of mutual understanding. A participant is obliged to interrupt the conversation if he believes that there is no mutual understanding, e.g. that he cannot accept that there is a mutual belief. It is again the case here, that the social practice (e.g. taking up an utterance or interrupting a conversation) not only has a referential meaning but also a social signalling effect.

This conceptualization proves that the assumption is incorrect (see Cramton, 2001: 349) that ‘there first must be mutual knowledge as a precondition for effective communication’ but rather the other way round: by communication intersubjective knowledge is established in local communication. In that way, participants in a communication develop a framework how coordination will take place. Blakar calls this framework a ‘shared social reality’ which resembles the notion of shared mental model.

Weick and Roberts (1993) mention contribution as an important feature of a collective mind. In their view contribution is meant exclusively as contribution in the content. This analysis suggests that contributing is also a social signal that a person has the mutual belief of understanding each other. Furthermore, this analysis suggests that one of the most important contributions could be to signal that mutual belief is not established yet.

Next to this social dynamics of how mutual knowledge is achieved, Clark (1996) also conceptualizes the causes that make somebody assume that mutual knowledge is (not) achieved. The question thus is: what makes somebody believe that there is mutual knowledge. Or more correct: what makes somebody accept the belief that there exists mutual knowledge between participants? Both – theories of distributed cognition as linguistics – formulate as an answer that expectations about the other’s behaviour establish the important hint whether mutual knowledge is achieved. When expectations are not met, the belief in mutual knowledge is weakened. The question is however, how can a participant in an epistemic community have expectations about the other’s behaviour if a participant does not have the other’s knowledge? Again, the answer is that expectations are in a sense calibrated within an interaction. “Thus any

actor will have certain notions concerning his own behaviour in the given role, which include the current ‘definitions of how its incumbent should act towards others’: these are his ‘role-expectations’. At the same time the actor will also have expectations ‘relative to the contingent probable reactions of others’: these are, from his point of view, ‘sanctions’ of his behaviour, punitive or rewarding. These two sets of expectations are always reciprocal in that ‘what are sanctions to ego are role-expectations to alter and vice versa’. In consequence there will be a mutual steering of behaviour resting on this ‘complementarity of expectations’ about how the given roles are to be played. In consequence there will be a mutual steering of behaviour resting on this ‘complementary of expectations’about how the given roles are to be played” (Parson quoted in Nadel, 1957: 51). Nadel adds that this complementarity of role expectation only works if other’s role is considered as legitimate and “that each actor should ‘care how others react to him’” (Nadel, 1957: 52). The parallel with heedful interrelating by Weick and Roberts (1993) is obvious. Furthermore, Nadel adds, we do not have to know other’s role expectations as such. Instead, role expectations about other’s behaviour are always related to my own role. “Rather, the knowledge I have of my own role inevitably includes assumptions about the reactions of others in their roles.”(Nadel, 1957: 52). Thus, my own role definition includes also expectations about other’s role definition. In case my expectations about other’s roles are violated the existence of mutual knowledge is questioned. When I think that I am a client of my doctor and that my doctor should treat me with my disease, a doctor who would comment my private (unhealthy) life would not fulfill my own expectations of a doctor given my own role definition as a client.. When, however, I define my own role as a patient I would probably appreciate his comments on my private life-style. Thus, role expectations of others are based on my own role definition. Depending on this definition I consider other’s behaviour as legitimate and thus fulfilling (or not) my expectations. The same comments on my private life by a friend of mine would be acceptable to me. This insight by Nadel (1957) suggests that it is not heedful interrelating towards other persons that makes a collective mind working but heedful interrelating with my own role definition. As my own role definition also defines my expectation of the other’s (appropriate) role behaviour.

Summing up: in this chapter I explained how intersubjective understanding could be achieved under the condition of distributed knowledge. It became clear that intersubjective understanding is realized by a communicative, joint act. Continuing contribution is considered as social signal that participants believe in the existence of

mutual understanding. Whether there is ‘really’ mutual understanding cannot be guaranteed or proved. Role expectations - or better - the violation of expectations are considered as important signal that intersubjective understanding does not exist (any more). Role expectations about other’s behaviour are defined by my own role definition.

Up to now I have conceptualized the necessary basic ingredients for cooperation in an epistemic community. This discussion proves that a belief in intersubjective understanding can also be realized under the condition of knowledge diversity. It became clear that in interaction roles and role expectations are defined in an interrelated way. Furthermore, I have shown how belief in intersubjective meaning can be achieved in interaction. Not fulfilling role expectations is the signal that intersubjective meaning has broken down. The other way round: there is never a guarantee that intersubjective meaning is ‘really’ achieved; there is only the acceptance of the belief that intersubjective meaning is realized.

Communication rule

An epistemic community for explorative learning was described as a self-designing system without a big master plan or a foreseeing manager at its core. Communication and patterns that evolve through communication are viewed as a means to establish meaningful behavior. As such, they have the same purpose as communication rules described by Schall (1983). “Communication rules have been variously defined but, in general, they are considered to be tacit understandings (…) about appropriate ways to interact (communicate) with others in given roles and situations, they are choices, not laws (…), and they allow interactors to interpret behavior in similar ways (to share meaning).” (Schall, 1983: 56). Consequently, Schall states that communication rules are an element of culture. Sticking to the communication rules determines whether somebody is a member of the collectivity where these rules are adopted (Circourel, 1973).

In contrast to Schall (1983) I do not try to identify ‘communication rules’ in their function as cultural glue, when they have already developed. Instead I try to conceptualize the development and dispersion of communication rules in an epistemic community. Thus, whereas I accept the function of communication rules as a means for interpreting behavior and making sense out of behavior I am more interested in the dynamics of these rules – hence the idea of communicative routines.

Script and Network Structure

So far, the requirements for cooperation in a multifunctional team are identified. In speech act theory and joint actions, the dynamics were found how roles, tasks and intersubjective understanding on these develop. Communicative, joint acts, as described above, conceptualize the micro-level how common grounds between participants can be established. All these processes take place in local interactions.

The claim of this paper, however, goes further. As the above processes take place on the micro-level between dyads, a multifunctional team should develop rules or routines – at the moment I use both words interchangeable - in its communication in order to spread these agreements throughout the network of the community. At the end, this may resemble a group mental model (Klimoski and Mohammed, 1994) or a representation (Weick and Roberts, 1993).

Spreading the agreements as they may be reached between dyads is not only a question of scaling up the communication processes. A dynamic of its own may develop.

Hutchins and Klausen (1996) stress the importance of redundancy in interactions in order to make intersubjective meaning available to other persons than the participants. This resonates with the description of the function of a third person in an interaction by Simmel (1950) who argues that a triad has – among other characteristics – that conflict between two is tempered by the third person. In epistemic communities this implies that the third person functions as a warranty or witness of the intersubjective meaning within the group

Another characteristics of a triad, according to Simmel (1950), is that secrets cannot easily be kept within a triad. There always exists the possibility that one of the persons leaves the personal interdependence which exists in a dyad. Thus, the third person can also have a function of a multiplicator of the achieved, intersubjective meaning. The application of the mutual knowledge, then, is expanded. In fact, the validity of the intersubjective meaning is enlarged in this function as a multiplicator. However, this, again, is a matter of a social acceptance process. When mutual knowledge gained in one situation is expanded into another situations or persons, this again is a question of acceptance. The third takes care that agreements are not secret agreements but can have the approval of the whole system.

These functions of a third person are in line with the view of an epistemic community as a script where people are related to each other as in a social network. Dyads, there, are not isolated entities but are connected to others in a network. In this way mutual

knowledge could spread like an oil stain. However, when an intersubjective meaning is not accepted 'outside' the local basis, this could be again fed-back by the third person to the original place. Then, the whole circle of defining roles, tasks and intersubjective meaning should start again with the third person as redundant.

When comparing a multifunctional team with a script, some of these features can be identified: a routine should follow a certain sequence. Just as in the restaurant script a sequence of actions exists, a communicative routine should also realize a certain sequence, especially in the tasks that have to be defined.

Conclusion

This paper tries to collect some of the ideas on how cooperation could take place in an epistemic community which is characterized by a multitude of various cognitive disciplines. Various authors have laid the groundwork on epistemic communities which should be conceptualized as distributed cognitive systems. The intention is to identify those mechanisms that make cooperation under the condition of cognitive distribution possible. Speech act theory and its development as joint acts provided a valuable conceptual framework for conceptualizing 'communicative routines'.

References

Austin, J.L. (1975) *How to do things with words*. Oxford: Oxford University Press

Bierwisch, M. (1980): Semantic Structure and Illocutionary Force. In: Searle, J.R., Kiefer, F., Bierwisch, M. (1980): *Speech Act Theory and Pragmatics*. Dordrecht: D.Reidel Publishing Company, p. 1-35

Boland, R.J., Tenkasi, R.V. (1995) Perspective Making and Perspective Taking in Communities of Knowing. *Organization Science*, vol. 6, no. 4, July-August 350-372

Bogenrieder, I., Nooteboom, B. (2004) The Emergence of Learning Communities: A Theoretical Analysis, in: H. Tsoukas, N. Mylonopoulos (ed.) *Organizations as*

Knowledge Systems. Knowledge, Learning and Dynamic Capabilities, New York: Palgrave Macmillan, 46-66

Circourel, A.V. (1973) *Cognitive Sociology*. Harmondsworth: Penguin

Clark, H.H. (1996) *Using Language*. Cambridge University Press

Clark, H.H., Marshall, C.R. (1981) Definite reference and mutual knowledge. In: A.K. Joshi, B.L. Webber, I.A. Sag: *Elements of Discourse Understanding*. Cambridge: Cambridge University Press, 10-63

Clark, H.H., Wilkes-Gibbs, D. (1986) *Referring as a collaborative process*. Cognition, 22, 1-39

Cramton, C.D. (2001) The Mutual Knowledge Problem and its Consequences for Dispersed Collaboration. *Organization Science*, vol.12, no. 3 May-June, 346-371

Crowston, K. (1997) A Coordination Theory Approach to Organizational Process Design, *Organization Science*, vol. 8 (2), March-April, 157-175

Dougherty, D. (1990) Understanding New Markets for New Products, *Strategic Management Journal*, vol. 11, Special Issue: Corporate Entrepreneurship, Summer, 59-78

Grant, R.M. (1996) Toward a Knowledge-Based Theory of the Firm, *Strategic Management Journal*, vol. 17 (Winter Special Issue), 109-122

Haas, P.M. (1992) Introduction: Epistemic Communities and International Policy Coordination. *International Organization*, vol. 46, no. 1, 1-35

Hutchins, E., Klausen, T. (1996) Distributed cognition in an airline cockpit. In: Y. Engestroem, D. Middleton (ed.) *Cognition and Communication at work*. Cambridge: Cambridge University Press, 15-34

Hutchins, E. (1999) *Cognition in the Wild*. Cambridge, Mass.: The MIT Press

Klimoski, R., Mohammed, S. (1994) Team Mental Model: Construct or Metaphor? *Journal of Management*, vol. 20, no. 2, 403-437

Krauss, R.M., Fussell, S.R. (1990) Mutual Knowledge and Communicative Effectiveness, in: J. Galegher, R.E. Kraut, C. Egido: *Intellectual Teamwork. Social and Technological Foundation of Cooperative Work*, Hillsdale: N.J.: Lawrence Earlbaum Ass., 111-145

McGrath, R.G. (2001) Exploratoy Learning, Innovative Capacity, and Managerial Oversight, *Academy of Management Journal*, vol. 44, no.1, 118-131

Nooteboom, B. (2000) Learning by Interaction: Absorptive Capacity, Cognitive Distance and Governance. *Journal of Management and Governance*, 4, 69-92

Nadel, S.F. (1957) *The Theory of Social Structure*. London: Cohen & West Ltd

Postrel, S. (2002) Islands of Shared Knowledge: Specialization and Mutual Understanding in Problem-Solving Teams, *Organization Science*, vol. 13, no.3, May-June, 303-320

Schall, M.S. (1983) A Communication-Rules Approach to Organizational Culture. *Administrative Science Quarterly*, 28, 557-581

Searle, J.R., Kiefer, F., Bierwisch, M. (1980): *Speech Act Theory and Pragmatics*. Dordrecht: D.Reidel Publishing Company

Simmel, G. (1950) *The Sociology of Georg Simmel*. Translated, edited, and with an Introduction by Kurt H. Wolff. London: The Free Press

Tsoukas, H. (1996) The Firm as a Distributed Knowledge System: A Constructionist Approach, *Strategic Managmenet Journal*, vol. 17 (Winter Special Issue), 11-25

Vanderveken, D. (1980) Illocutionary Logic and self-defeating Speeach Acts. In: Searle, J.R., Kiefer, F., Bierwisch, M. (1980): *Speech Act Theory and Pragmatics*. Dordrecht: D.Reidel Publishing Company, p.247-272

Wegner, D.M., Erber, R., Raymond, P. (1991) Transactive Memory in Close Relationships, *Journal of Personality and Social Psychology*, vol. 61, no.6, 923-929

Weick, K.E., Roberts, K.H. (1993) Collective Mind in Organizations: Heedful Interrelating on Flight Decks. *Administrative Science Quarterly*, 38L 357-381