

Organizational Forms and Knowledge Types: A Semiotic Perspective

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1. Introduction

In his beautiful novel “The curious Enlightenment of Professor Caritat” Stefan Lukes (1995) describes the journey of his main character, Professor Caritat, in a fictitious world. Just like Voltaire’s *Candide* (Pangloss), Caritat is looking for the best possible (organizational) world. Therefore, Caritat visits several countries named after their leading organizational principle. He starts in Militaria, then goes to Utilitaria, to Communitaria, to Proletaria, to Libertaria and to Egalitaria. At the end of his journey, Caritat encounters another traveler (an owl) telling him the following. “Take the countries you have visited. Every country focuses on the realization of one respectable ideal: the first tried to guarantee order and security, the next pursued as much happiness and wealth as possible, the third wanted to provide its inhabitants an enduring identity, such that they felt at home with their fellow countryman. Another pursued the delusion of real individual freedom in harmony with all the others, the next pursued the idea that all their individual citizens and properties should be free of obstacles in order to live as they wanted. Every country pursued its favorite goal with the exclusion of all other goals, thereby sacrificing many individual human beings on the altar of their abstract ideal. How many lives have not been broken and destroyed in the name of such ideals? What utter nonsense.” “But”, said Caritat, “what is the alternative?” “The interconnection, that is the issue!”, said the other traveler, “The alternative is to recognize that none of the ideals is worth anything without the other ideals. Only then you will be able to create a world that is suitable for humans ... and other beings.” (p. 312-313). The journey of Caritat is full of wit, philosophical discussions and references to the Enlightenment. Although Caritat visits all the countries and has talks with many individuals, he only looks at the leading principles as given, without asking himself the really important question: where do all the leading principles come from? Do they come from a higher Being, are they just there, are they the result of historical developments or do they have something to do with the (formalized) opinions and beliefs of individual people?

Furthermore, after the conclusion that not one leading principle should reign, but that interconnections should do the job, no question is raised why this is the case or how this could be accomplished. I claim that although Caritat is talking about organizational principles, he is discussing this issue at an inadequate level of description. Perhaps because of the absence of a conceptual framework, he does not take into account individual actors with their (avowed) knowledge. To my opinion discussions about organizational principles and goals and the realized coordination mechanisms are a matter of knowledge and knowledge management. It is obvious that leading principles are always also the result of discussions in terms of the **content** of knowledge. I do not argue about that. What I want to emphasize is that the **forms** (types) of knowledge and their distribution and dominancy within and between people in relation to tasks in an organization or society are important in explaining the various organizational forms and the operationalization of what interconnection means.

Important in this discussion is the presence of a conceptual framework to deal with (forms

of) knowledge within organizational settings. In this article I will unfold a first version of this framework and its application as follows. I will start, in section 2, with some definitions of organization after which I will focus on a multi-actor perspective. In the next section (3) I will go into the details of what we mean by an actor and what the consequences are of this interpretation in terms of knowledge and its operationalization. In section 4 I will connect various forms of knowledge with tasks and processes in organizations. Section 3 and 4 have a semiotic flavor. In section 5 I will relate the knowledge types to organizational forms and coordination mechanisms. Section 6 gives some conclusions with relation to knowledge management and what is called the learning organization.

2. The organization in a multi-actor perspective

I want to start with some strange questions. Everybody is talking about organizations, but where is the organization? When does an organization exist? Everybody will agree that Shell as an organization not only exists from nine to five and is closed on Saturdays and Sundays. Neither are the buildings and the other artefacts the reason that we can say that Shell exists. In organizational literature (Daft, 2000) it is argued that an organization exists because of the many processes that are carried out. Organizations in this sense are collections of processes. Sometimes the processes themselves are conceived of as entities. Daft (2000) says, for example, that “organizations are social entities that are goal directed, are designed as coordinated activity systems and linked to external environment” (p. 12). Sorge (in Sorge & Warner, 2001) says that two meanings of organization should be discerned: organization may refer to a social unity (or collectiveness) and organization may refer to organizational properties. In this article I am talking about organization as a social unity. It is also possible to define an organization as “the simultaneous functionalization and coordination of human actions with regard to objective goals.” (van Dale, 1995, p. 2144). In this definition the emphasis is on actions that, by the way, can be classified within processes. In the definition also goals and coordination are mentioned. A goal is immediately related to a primary process. That is the reason that the organization exists. Coordination is needed because “entities,” such as actions, tasks or processes, do not form natural units. They need some kind of coherence or cohesion structure. This coherence can be organized externally, in a legal or financial way, or internally by an interpreting and meaning given entity, which in this case is an actor.

In general, the structural (organizational) coherence in processes executed by humans and machines, consisting of actions and tasks, is regulated by legal and financial constructions. This means that ultimately an organization is a construction or a construct. In the past, for example in the 19th century and earlier, this construction consisted as a unity in time, place and action. Organizations were small, people worked face-to-face, there were no clear boundaries and besides the realization of the primary process, an implicit goal always was to realize consolidation (Sorge, 2001). Much has changed since. The unity of action does not exist anymore. Work, labor and action have been divided and distributed. Since the abundant presence of digital communication, the unity of place and of time are also disappearing. The organizational literature gives many suggestions to overcome the disadvantages of the loss of unity in action, time and place (Thompson, 1967; Gazendam, 1993). The present “E-lization” of and within organizations requires a new view on organizations. I come back to this issue in section 6.

The returning cornerstone in organizations is the “process”. A process is “an action in its

progress” (van Dale, 1995, p. 2378). I want to argue that in the analysis of processes - that is to say action sequences - the executing entity often is neglected. A process needs a material carrier. A process runs on something, just like software runs on a computer. In production environments the carriers often are the machines, the instruments, the tools, the computers and the employees. In service and administration environments the material carriers of processes are the employees and the computers. It is interesting, however, to see that details and interpretation of the employees are very vague. The same holds for the realization and interpretation of what is called the coordination mechanism in an organization. It has to be stated that often the realization of processes is a highly abstract, almost metaphysical affair in many organizational studies (see Sorge & Warner, 2001). From a knowledge perspective this abstract meta-individual perspective is strange and to my opinion unwanted and unnecessary. Especially, with regard to knowledge in organizations, an organization basically consists of individuals executing tasks. Individuals, alone or in groups, execute tasks by which they use interpretation, intelligence and knowledge. Even coordination, planning and control - normally called the secondary processes (see section 4) - are in the hands of individuals, as separate tasks or as part of their palette of tasks in their function.

Furthermore, an organization is rooted in the individuals that are part of the organization and can think of the organization. Without thinking of an organization, there is no organization, even if there are constructs and artifacts as buildings and machines. As Sorge (2001, p. 7) says “Of course, there would not be any organization behavior without human behavior.” The basic ingredients of an organization are the intelligent actors. This means that there exists a nesting of a) actors within organizations and b) organizations within actors. The first nesting means that an organization always consists of a collection or group of actors. This makes an organization a multi-actor system. The second means that a set of actors can form an organization, but only in the sense that an actor can think of and reason about what the other actors can do. The other actors in turn have opinions and beliefs, that is to say representations, about the first actor. This implies that an organization as a construct consists of the overlap and sharing of individual representations. The key notions, here, are representation and interpretation. An organization is a representation in the eyes of (intelligent) actors.

This fundamental interpretation of “organization” puts a stop to the unlimited misuse of metaphors. An organization as a human-made construct is not an object such as a car, a bridge or a computer. By talking about multi-actors and representations unjust reification is restricted. An organization can be described by a metaphor, but so called properties as “the will”, “cognition”, “memory” and “motives” of organizations should not be taken literally. This also settles the discussion whether organizations have knowledge, have a memory and can learn. These expressions only have meaning, metaphorically. Literally, or materially, speaking organizations have no memory, no knowledge and cannot learn.

In the remainder of this article an organization is conceived of as a multi-actor system consisting of natural (and artificial) actors. Although actor principally refers to a human individual, it might and will in the (near) future also include software actors (or agents), which may be intelligent information and knowledge processing entities. In the next section I will go into details of the specific characteristics of actors, especially human actors. What does it mean to have cognitively and psychologically plausible actors.

3. Aspects of actors

To view an organization as a multi-actor system requires a more detailed analysis of the

characteristics of actors (Gazendam & Jorna, 1998). Actors can be discerned regarding the presence or absence of the following components: a) perception, b) interaction (including learning in the sense of habit formation), c) representation and interpretation (including learning in the sense of chunking and creation) and d) autonomy and self-repair.

With perception I mean that a system must be able to accept input in a general sense. This input may include visible, audible and tangible stimuli and the accepting system may vary from a lobster to a human being or even a computer system. Interaction is the process by which a system has contact with its environment. Stimuli as input in the system lead to output in the sense of responses. The reaction patterns of the system may result in learned behavior, that is to say that habits are formed.

A system that internally symbolizes the environment is said to have and use representations. Representations consist of sets of symbol structures on which operations are defined (Jorna, 1990). Examples of representations are words, pictures, semantic nets, propositions or temporal strings. A representational system learns by means of chunking mechanisms, by the creation and manipulation of symbol transformations.

A system is said to be autonomous or self-organized if it is able to have a representation of its own (physical and conceptual) position in the environment. This means that the system has self-representation. An autonomous system has reconstructing representational interaction patterns.

The four aspects together result in a sort of actor hierarchy. An actor that only has perception is at the lowest level and can not be called an intelligent actor, whereas an actor with self-organization is the highest level, including perception, interaction and representations. This last form is what we regularly call an actor that is reflective, intelligent and thoughtful. Human beings are good instantiations of intelligent actors. Computers are said to have representations, but not self-organization. If computers can do tasks for which it is indicated that humans perform these tasks with intelligence, computers have intelligence, at least to a certain degree. This depends on what one's definition of intelligence contains.

Not every actor is intelligent, but every intelligent system is an actor. The above described classification in perception, interaction, representation and autonomy can be related to a qualification of actors. First we make a distinction in single actors and multiple actors. Second we subdivide actors in response function systems, representational systems and representational response function systems. The use of the term system implies that we consider an actor to be a coherent whole, consisting of several components, for example motor parts, sensory parts, including perception, and cognitive parts. The parts will not be discussed in detail, here (see Posner, 1989; Newell, 1990). Concerning multiple actors the surplus component is a (complicated) communication and coordination mechanism, that realizes the interaction of actors. This mechanism has to be intelligent and should, in its deepest analysis, also be incorporated in a human system.

I start with an environment in which an "entity" is present. We are talking about a cohesive, structured and organized entity. This entity operates in an environment, but no specifications of its operations are given. In a sense this entity is an actor, because it is self-contained, strives toward continuation and, looking at the actor characteristics, it has perception and interaction including the possibility of learning in the sense of habit formation. I emphasize that this actor does not have internal representations. Its cognitive domain is absent or empty. I call this actor a response function system (RF-system), or Actor I, and it can be compared with the ant in the sand (Simon, 1969). Simon defends the position that the behavior of an ant can be called

complex, although not intelligent, because it is a function of the complexity of the sandy environment that it has to cross.

Keeping the environment the same, I can conceive another actor that I call a representational system (R-system). This actor has representations and is able to project external events internally into its cognitive domain. I call this Actor II. This representational system has perception, representation and autonomy. The interaction is problematic, that is to say that there is no device that semantically interprets causal input and output. As far as we talk about interaction it is rather low level reaction to stimuli. If we look at present day cognitive science most linguistically and logically oriented researchers have such a kind of actor in mind.

If I keep the environment still the same, the third possible interpretation of an actor is the representational response function actor (RRF-system). This actor incorporates a really intelligent, interactive and cognitive system. I call this Actor III. This actor is able to perceive, to interact, to represent and to be autonomous. Cognitive processes include symbols, operations and semantic interpretable response functions. RRF-systems behave on the knowledge level, as Newell called it. "There exists a distinct computer systems level, lying immediately above the symbol level, which is characterized by knowledge as the medium and the principle of rationality as the law of behaviour." (1982, p. 99) The actor equipped with the integration of representations and response has knowledge. "Knowledge", says Newell, "is whatever can be ascribed to an actor, such that its behavior can be computed according to the principle of rationality." (Newell, 1982, p. 105) The principle of rationality is expressed in the belief that an acting person will undertake those actions by which his goals are reached. These actors are submitted to what Simon (1947/76) called: "bounded rationality".

The hierarchy of single actors returns in the composition of multi-actor systems. In the first place it is possible to have a multi-actor system in which the actors are response function systems. The situation is comparable to the single actor system in that the actors do not have internal representations. In this circumscription of multi-actors other actors are considered to be parts of the environment. The only difference is that there is a proximal and a distal environment. The system borders define an inner and an outer area. The actors all have perception and interaction. To take up the example of Simon's ant we are talking here about a group of ants perceiving and interacting with each other. Coordination is absent or only defined in terms of reactions to behavior of other actors. To make a provocative statement, I state that although organizational theory speaks about the coordination of multiple intelligent actors, in practice the actors are mostly defined as response function systems, that is to say as Actor I.

In the second place we have a multi-actor system consisting of representational systems. Every actor has internal representations in the sense of symbol structures and operations. Interaction is only possible if the symbol structures are similar, that is to say in the form of strong codes, such as notations (Goodman, 1968). It is of course doubtful whether interaction between the actors is semantically meaningful. In discussions about social cognition the issue of semantic interaction is ticked off, but not resolved. Intelligent coordination without communication in terms of notations is hardly handled. In its pure form software agents, such as search engines on the web or server software on intranet, are excellent examples of Actor II.

In the third place there are the representational response function systems in a multi-actor situation. The actors perceive each other and react to each other in a semantically rich and intelligent way. Each actor has perception, interaction, representation and autonomy and

manages to integrate this into the organization as a multi-actor system. A collection of human information processing systems - the organization as multi-actor perspective - is an example of multiple representational response function systems.

The only meaningful incorporation of knowledge, cognition and representation in organizational theory is in a representational response function system. This holds for a single actor as well as for multi-actor systems. This does not mean that all actors in such a multi-actor system have to be RRF-systems. Some actors in the multi-actor system may be RF-systems or R-systems, but at least one of the actors has to be a RRF-system. The interpretation of an actor or a multi-actor system as a RRF makes it possible to introduce cognition, knowledge, interpretation and symbol/sign manipulation concepts. This combination of terms refers to cognitive science (Posner, 1989), to knowledge management (Jorna, 1998) and to semiotics (Michon, Jackson and Jorna, 2001). Cognition and knowledge will be discussed in section 4. I will end this section with some remarks about the semiotics of interpreting an organization as a representation of an actor.

An organization is a semiotic entity. It is semiotic as an entity, because of its participants, its processes and outcomes. With semiotic I mean that an organization as an artefact, a construct or a representation, basically is a sign type or sign token. The interesting point of looking at an organization as a semiotic entity can be found in the different sorts of signs that turn up in the communication and information structures of the various single and multiple actors. In semiotics it is normal to distinguish signals from signs and to subdivide signs in icons, indexes and symbols. Icons emphasize the similarity aspect, indexes the contiguity aspect and symbols the conventional aspect of signs. In relation to type III actors - the RRF systems - semiotics gives a conceptual apparatus to deal with knowledge, communication, representations, symbol structures, interpretation and meaning (Nöth, 2000).

4. Knowledge and knowledge types

In our view of organizations as multi-actor systems the actors in these systems are representational response function systems (Gazendam & Jorna, 1998). Within this actor perspective, knowledge consists of representations and learning consists of change and the conversion of representations and resulting behavior. Important is the discussion of how we can deal with knowledge management and learning in organizations within this multi-actor (actor as semio-cognitive entity) perspective. To show this we first discuss the relation of knowledge, data and information. Then we will explain three types of knowledge.

Knowledge, information and data are closely connected. The raw material of data is the unformatted unstructured material in the world (Jorna & Simons, 1992; Schreiber a.o. 2000). Data are such things as the various signals - acoustic, visual, tactile and otherwise - that are around us that can be interpreted as (having) information. The relation between data and information formally is that information is a structuring of data that reduces uncertainty. The information value of a message is higher if it reduces more uncertainty. In a more informal way it could be said that information is interpreted data. Knowledge is the interpretation of information in the eye of a beholder using his own history, his experiences and interpretation schemes. That is the reason why the same information may lead to different knowledge for various individuals.

What we have just indicated on the triplet data, information and knowledge seem to imply a static and stable model of knowledge. This is not true. Knowledge in contrast to data and information is tightly connected to the person who has the knowledge. However, knowledge

itself is not something that is ready made in someone's cognition (Newell, 1990). It has to be mentally restructured and constructed again and again. That is also the reason that it is so difficult to grasp or to lay a hand on knowledge in content or in form. Therefore, formulated in a more dynamical way, the relation between data, information and knowledge means that a person receives data and with the knowledge he or she has, data becomes information, which in turn changes the knowledge of the interpreting person.

The various aspects of knowledge make it almost impossible to define types of knowledge unambiguously. Traditionally conflicting epistemological, psychological and cultural categories can easily be distinguished. To avoid endless debates, we start from a semiotic perspective. Based on the information concepts of Boisot (1995), we define a more dynamic model for knowledge types (van Heusden & Jorna, 2001). We start with three types of (semiotically inspired) knowledge: a) tacit or perceptual, b) coded, and c) theoretical knowledge. This typology of knowledge types refers to the number of semiotic dimensions involved in the representation. It should be borne in mind that we are not talking about the knowledge **content**, but about knowledge **form**, that is to say its types

The first type is about tacit or perceptual knowledge. It starts from a perception of difference, that is interpreted in terms of an analogy. The first semiotic step is always to recognize the situation in terms of a situation (or state of affairs) you already know. This is particularly clear when we look at the interpretations of works of art. In art, perception is rendered problematic. Art confronts us with contradictory signs and forces us to find coherence. The organizational operationalization is that some of us have an acute sense of differences; they are intense perceivers, while others tend to overlook most differences and concentrate on identities. We find ourselves, at this point, at the level of 'sense making' (Choo 1998).

The one-dimensional representation underlies what Michael Polanyi has coined as 'personal knowledge' (Polanyi, 1966). He describes the semiotic process involved in this tacit knowledge as being "aware of that from which we are attending to another thing, in the appearance of that thing" (11). Tacit knowledge is also bodily knowledge: "when we make a thing function as the proximal term of tacit knowing, we incorporate it in our body - or extend our body to include it - so that we come to dwell in it" (16). This type of knowledge can not be coded, it is about concrete experiences, and it can be shared only with those who are co-present.

Differentiation of this type of knowledge can be done by the measurement of detail. The more detailed a representation is, the higher the level of representational knowledge. Knowledge of details is of course relative to a certain domain, and to the knowledge about the domain of others in the same field. Thus a professional will be able to perceive more when looking at a certain activity than an amateur. The determination of this perceptual or tacit knowledge certainly is not easy. One cannot rely upon verbal reports. Personal knowledge must therefore be determined through the analysis of behavior, that is, of what someone is able to do in a certain situation.

A knowledge type becomes a two-dimensional phenomenon when, out of the relation between the two events in the process of representation, a new dimension emerges. This new dimension is the dimension of the sign as code. With the two-dimensional sign codes emerge. A code is nothing else than a convention establishing a relation of substitution. The two-dimensional sign requires communication and makes communication easier. The two-dimensional sign is therefore basically a social sign.

Although categorization in codes (mostly) is conventional and rests upon the grouping of

features, this knowledge enables us to communicate about our experience. In other words, the diffusion of knowledge becomes easier where two-dimensional signs (codes) are available (Boisot 1995). Giving names and categorizing is the basic process in this phase of semiosis. Externalization and diffusion requires coding.

The two-dimensional sign also is tied to a context, but this is not any longer the context of a concrete state of affairs. In terms of Boisot (1995): the diffusion of the sign now takes place along the lines of a social community. It is important to realize that two dimensions presuppose one dimension. First, there must be the difference in perception that triggers the semiotic process and only then the substitution takes place. This means that one can discuss substitutions (codes) without relating them to concrete events. Effective communication depends on a mixture of words and gesture, text and example. Partners do not need to be co-present. Basic knowledge, therefore, at this level, is social and communicative knowledge, needed for the decision making which underlies all coding (Choo 1998). Coded knowledge does not allow us to foresee what will happen, whereas theoretical knowledge does. Taxonomies are a good example of coded knowledge.

How can we differentiate the codedness of knowledge? Codes can be differentiated by taking into account the number of elements and combination rules a code consists of, as well as the degree of ambiguity allowed. Thus musical notation systems are more strongly coded than natural languages. At the lowest level of codification, codes tend to dissipate into concrete, that is, one-dimensional perceptual knowledge. Therefore, in the use of images and metaphors, coded knowledge comes closest to the non-coded concrete knowledge of the first phase. Operationalization for the levels of codification can be found in Goodman (1968) who uses five syntactic and semantic requirements to distinguish weaker and stronger sets of signs (see also Jorna, 1990).

The third type of knowledge, theoretical knowledge, emerges when to perceptual difference and codification (substitution) a third dimension is added, which is that of the logical or formal relation. Knowledge is theoretical when coded signs relate to the events represented, not on the basis of a convention, but on the basis of formal or structural qualities (their number, for instance). In the third phase, knowledge becomes even more abstract. Perception (tacit) and categorization (coded) are extended with the aspect of (necessary) structure. Basically, theoretical knowledge is knowledge about the necessary relations between events and categories of events. Most scientific knowledge belongs here. This knowledge is the result of scientific inquiry – empirical as well as theoretical, inductive and deductive. It is the result of answer to the ever returning question: why is so and so the case? Knowledge is discovered, more than 'invented'; that's why it is about the (logical) structure. It should be clear that theoretical knowledge makes diffusion even easier than coded knowledge does: theoretical knowledge is not, in principle, conventional, but universal. Although codification is needed to communicate this abstract knowledge, the knowledge goes beyond coding. Codification is the vehicle. However, basically it is independent of historical contexts, unlike systems of categorization such as, for example, the natural languages.

Various attempts to differentiate theoretical knowledge can be found. One such a differentiation is in terms of levels of abstraction. The more entities belong to a concept the more abstract the concept is. Mammal is more abstract than dog which is more abstract than poodle. Another proposal is the more complex the knowledge is the more abstract it is. A more extended discussion is given in van Heusden & Jorna (2001).

In reality tacit, coded and theoretical knowledge are not in a clear-cut way divided over

actors executing tasks. It is the distribution of the types within and over actors and the dominance of one type in a task or a collection of tasks that matters. As indicated, theoretical knowledge builds upon coded knowledge which in turn builds upon tacit knowledge. This means that even if the dominant type is theoretical, always tacit knowledge is present. Learning and experience in this context not only mean an extension of existing knowledge, of whatever type it is, but it may also mean a change or conversion of type. I repeat that fundamental in our approach is that humans as information processing systems with knowledge and cognition execute tasks and that irrespective of the content of the knowledge used in executing the task the form of knowledge can be characterized. I will elaborate this perspective with respect to organizational forms.

5. Knowledge types and organizational forms

The discussion about organizational forms or structures is not primarily about primary processes. The way a hospital treats and cures patients and the way the food processing industries produce, for example, canned food or custard, concern the specialized knowledge of the consecutive domains. This knowledge is necessary for the primary processes. The way these primary processes are structured and interrelated concerns the organizational processes. The organizational processes can first be lifted out and separated from the primary processes or, secondly, they can be mixed up with the primary processes. The former are called secondary processes. They can be considered as helping, coordinating or servicing processes. In the latter case the processes are constituting elements of the primary processes. To make things even more complicated, the secondary processes can be completely cut off from the original organization and can be put into a new organization or department, which primary process then is the execution of the secondary processes. I call these second order primary processes. For the line of reasoning it does not matter whether we are talking of integrated organizational processes, of (separated) secondary processes or of second order primary processes. For reasons of clarity I will only refer to the (separated) secondary processes.

Secondary processes can be described in terms of their constituting tasks. Examples of these tasks are control, planning, administration, monitoring, communication, maintenance and perhaps contracting. Control concerns the task in which the right and power to command, decide, rule and judge is executed. Planning is the task in which the courses of actions at a strategic, tactical or operational level are determined. Administration is here meant to set down and establish all kind of information regarding the primary (and secondary) processes. Monitoring means the task to follow and assess the progress of the various products, services or primary processes in the organization. Communication is the task to keep in contact, orally or in written form, with the other members of the organization. Maintenance concerns the support and upkeep of the means of production and services. Contracting is the task to manage and arrange the promises and appointments within and outside the organization in a formal (legal) manner.

All these tasks are executed by (groups of) individuals using knowledge in terms of content and form or type. My main interest is not in the content of the secondary tasks but in the possible types of knowledge that might be discerned. As indicated in section 4 the types of knowledge are tacit, coded and theoretical. I presuppose that the secondary processes in organizations are carried out by individuals and that they have knowledge. Although in practice all types of knowledge exist for every individual, it does not mean that a uniform distribution exists. It is to be expected that one type is dominant over the others. The

determination of dominance for an individual can be applied to all individuals, active in the secondary processes. It can also be determined for the separate tasks out of which the secondary processes exist.

We now have three possible orientations to look at the distribution and dominance of knowledge types. First, we can take one task as part of the secondary process and determine for all the individuals involved the dominant knowledge type. Second, we can look at one individual, execute various tasks within the secondary process, and determine the overall dominance of one or more knowledge types. Third, we can generalize over tasks and individuals and determine the distribution and dominance of knowledge types in the secondary processes. For reasons of brevity I will neglect the level of one task and one individual in particular. I will only look at the secondary processes at large. Theoretically, eight possible combinations of the presence and absence of the three knowledge types can be determined, but the absence of any type of knowledge is not a realistic possibility. Therefore, seven combinations are left, ranging from tacit (+), coded (+) and theoretical (+) to tacit (+), coded (-) and theoretical (-) knowledge.

For the moment we now turn away from the knowledge type and secondary process level and direct our attention to the other end of the spectrum where organizational forms are labeled. Many labels can be found (Sorge, 2001), but the most prominent ones are from Thompson, Mintzberg and Boisot. Concerning forms of organizations Thompson (1967) describes the coordination within an organization in terms of (task or process) interdependence. Of course, an organization can have no interdependence, but then organization and individual actor coincide. The more interesting cases are: pooled interdependence, sequential interdependence and reciprocal interdependence. Pooled interdependence concerns independent departments, that is to say a divisional structure. Sequential interdependence relates to the situation where the output of A is the input for B. In reciprocal interdependence the output of A is the input for B and the output for B is the input for A. Mintzberg (1979) in describing the development of organizational forms enumerates five forms: a simple structure, a machine bureaucracy, a professional bureaucracy, a divisionalized form and an adhocracy. On the one hand the various forms indicate a kind of evolution of a particular organization in time. On the other hand a determination of any organization can be made, because of the dominance of the operating core, the strategic apex, the techno-structure, etc. Boisot (1995) in a similar way as Mintzberg dealing with the evolution of organizations makes a distinction in chief, clan, market and bureaucracy. Boisot distinguishes organizations in terms of the codedness, the concreteness and the diffusion of information. The organizational forms discussed by Thompson, Mintzberg and Boisot are based on decomposition structures, ways of coordination and the characterization of information. Other divisions take into account the authority relation - for example, the subdivision into monarchy, bureaucracy, aristocracy, meritocracy, democracy or technocracy (see also Sorge & Warner, 2001), institutional factors (Williamson, 1975) or organizational strategies (prospector, defender, analyzer, etc.; Miles & Snow, 1978). It is also possible to start from leading principles. In that case markets are based on competition, bureaucracies are based on rules, and clan or collective are based on trust. Whatever division is taken types of knowledge, representations and tasks are not mentioned or not used as the primary dimension to distinguish organizational forms. Why are the organizational forms what they are in terms of knowledge? In table 1 the combinations of dominance of knowledge type and organizational form are presented. The level of analysis is the secondary process. The combinations are not the result of empirical research. They are

the result of analytical reasoning and could be reformulated as hypotheses. I will illustrate the reasoning by shortly discussing the market (ta +; c +; th +) and the professional bureaucracy (ta -; c +; th +).

Tacit	Coded	Theoretical	Organizational form
+	-	-	Simple Structure; Adhocracy: Clan; Fief; Family
-	+	-	Machine bureaucracy
-	-	+	Not applicable (Roman Church?)
+	+	-	Divisionalized form
+	-	+	R&D department; University research
-	+	+	Professional bureaucracy; University faculty
+	+	+	Market (but secondary processes are external)
-	-	-	Not applicable

Table 1: Organizational forms in terms of the dominance of knowledge types for secondary processes.

A market is characterized by many autonomous actors. The coordination as a secondary process is done by means of an “invisible hand”, it is realized external to the organization itself. The interaction is based on rivalry and competition. In theory the actors are said to be equivalent, but in practice they are very different. The actors internally work on the basis of local information, whereas external comparison is done in terms of prices. Because the actors are so diversified in reality, it implies that an actor with much tacit knowledge competes with an actor with much coded and theoretical knowledge and that two actors with both dominant coded knowledge negotiate with one another. The variety of actors, involved in the market, explains the presence of all types of knowledge (ta +; c -; th+). It also explains the complexity of market situations.

In a professional bureaucracy (Mintzberg, 1979) the operational core consists of highly trained and well-specialized professionals. Many of them may have an academic background. This means that the secondary processes of coordination, control and planning are executed in close relation to the internal structure of the professions. The knowledge they use is coded in the sense that is represented and documented in rules, procedures and scripts. The knowledge is also theoretical because in answer to “questions why” explanations, theories and “logical necessities” can be formulated. Very little knowledge is tacit, which can be illustrated by the long explicitly structured training period the novices in the organization have to undergo. Examples of these organizations are hospitals, universities and ministries in certain fields (agriculture, economics or justice). In contrast to the governmental ministries, the local government is a machine bureaucracy, because of the absence of theoretical knowledge. Local government officials use rules and procedures and not theories and models in explaining why things are done in certain ways.

6. Conclusion: knowledge management and organizational forms

The intention of this article is to combine knowledge and knowledge types with forms of organizations. Conceptually a big distance has to be bridged. Knowledge is something individuals entertain with their cognitive system. Organizations are social units or collectives dealing with the cooperation and coordination of their divided and distributed tasks as part of primary (and secondary) processes.

I showed how we bridged this gap by first interpreting organizations as multi-actor systems. This paves the way for the semio-cognitive approach to actors (natural and artificial). Second, I analyzed the secondary process in terms of tasks, such as planning, control and communication. This operationalizes the perspective that human as information processing systems execute tasks by which they use knowledge. Third, I showed that besides the content of knowledge also the form (type) of knowledge is important. Three types were distinguished: tacit, coded and theoretical. Finally, I showed that various distributions and dominance of knowledge types matches well-known organizational forms and coordination mechanisms with labels, such machine bureaucracy, simple structure, clan or market.

I argue that this gives an operationalization of knowledge management with respect to the tasks that constitute the secondary process. If knowledge is used in the secondary process, and no one would deny that, than in order to be managed knowledge has to become observable and “measurable”. The interesting point I tried to make, here, is that more than just random matches seem to exist with organizational forms. There are two others interesting points. The first relates to innovation, the second to digitalization (or E-lization). Innovation as a radical change in, for example, ways of working and coordination and control is bounded by the types of knowledge that are present in an organizational structure. If the types of knowledge are “wrongly” distributed or the “wrong” one is dominant, the innovation process may be strongly impaired. Concerning digitalization the unspoken assumption is that knowledge has to be or could be coded. As can be seen from table 1 some organizational forms work with a lot of tacit knowledge and even if knowledge is coded it still has a smaller or larger part that is tacit. Looking at the level of tasks - not done in this article - it can easily be determined why certain computerization projects fail and will continue to fail. This is relevant because more and more of our actor companions in organizations are artificial instead of natural entities.

Lukes' forms	Tacit	Coded	Theoretical
Militaria	-	+	-
Utilitaria	-	+	-
Communitaria	-	+	-
Proletaria	-	+	-
Liberitaria	-	+	-
Egalitaria	-	+	-

Table 2: Lukes' forms as dominant type of knowledge

Finally, what about professor Caritat. As I have pointed out in table 2, all countries completely coded their leading principle. If the owl talks about interconnection, he seems to be mean that various leading principles should be or could be present at the same time in a country. This can only be realized if the knowledge contained in a principle has various forms. If the leading principles are coded in one country at the same time, contradictions will occur. Contradictions can only be prevented if the knowledge types of the leading principles have various forms. Interconnection - the solution of the owl - can only be realized if the **types** of knowledge are interrelated and not only the **principles**. Professor Caritat still has a lot to learn if it comes down to knowledge management.

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