

Organizational Form as a Function of Knowledge Types Distribution

René J. Jorna

Faculty of Management & Organization
University of Groningen
PO 800, 9700 AV Groningen
The Netherlands.
E-mail: r.j.j.m.jorna@bdk.rug.nl

Abstract

In this article knowledge types are combined with organizational forms. Knowledge is something only individual actors have. Regarding knowledge not only content, but also type can be discerned. Three knowledge types are distinguished: sensory, coded and theoretical. In developing a conceptual framework for the cognitive analysis of knowledge management, I will demonstrate that dominance and various distributions of knowledge types fit well-known organizational forms and coordination mechanisms with labels such as machine bureaucracy, simple structure, professional bureaucracy and market.

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 finally to Egalitaria. At the end of his journey, Caritat encounters another traveler (an owl) telling him the following. “Consider the countries you have visited, all of which you have left behind. Each was devoted to the pursuit of a worthy objective: one to ensure order and security, another to maximizing welfare and happiness, another to secure stable identities where people feel at home with others of their kind, another to the delirious vision of real individual freedom in harmony with all others, another to the protecting of individuals and their property from interference to live as they choose. Yet each pursued its favored goal to the exclusion of the others and in the process sacrificed countless individual human beings at the altar of its abstract ideal. How many human lives have been ruined and destroyed in the name of such ideals? What human folly!” “What,” Nicolas (= Caritat) asked, “is the alternative?” “Only connect,” replied the owl. “The alternative is to see that none of these ideals is worth anything without the others. Only then will you create a world fit for humans [...]” (p. 257). The journey of Caritat is full of wit, philosophical discussions and references to the Enlightenment. Although Caritat talks with leading persons in every country, he does not consider the inhabitants of countries as cognitive, emotional and active individuals.

My argument in this article is that in the same spirit as Caritat does - and the owl implicitly criticizes Caritat for this - humans as information processing systems that behave intelligently and use and interpret knowledge are often neglected in discussions about organizations (Sorge & Warner 2001). Organizational and societal principles are on the hand the expressions of thought processes of human individuals. On the other hand they are present, active and relevant because of the individuals who interpret and represent the principles as beliefs, opinions and knowledge, and who base constructs, artifacts and structures upon them. The point is that this argument requires a conceptual framework at another level of aggregation than is usually practiced in discussions about knowledge and knowledge management in organizations (Laudon 2001). Instead of with organizational principles, coordination mechanisms and organizational

forms, we have to start with individual actors with their avowed and tacit knowledge, with their interpretations and representations. Discussions about organizational principles and goals and the realized coordination mechanisms are a matter of knowledge and knowledge management. Obviously, leading principles are always also the result of discussions about the **content** of knowledge. I do not argue about that. What I want to emphasize is that the **types** (forms) of knowledge and their distribution and dominance 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 “connection” - as the owl to Caritat says - must mean.

Important in this whole 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 to organizational principles. I will start, in section 2, with expressing my position concerning knowledge and actors. In this section I will also discuss the concept of organization. In the next section (3) I will go into the details of what is meant by an actor and what the consequences are of this interpretation in terms of knowledge and its realization in types of knowledge, and I will discuss various types of knowledge. In section 4 I will relate the knowledge types to organizational forms and coordination mechanisms. Section 5 gives conclusions in relation to knowledge management, innovation and information systems.

2. An organization in a multi-actor perspective

In our view on organizations as multi-actor systems the actors in these systems are representational response function systems (Gazendam & Jorna 1998). 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 (Goodman 1968; Jorna 1990; Michon, Jackson, Jorna 2003). Examples of representations are words, pictures, semantic nets, propositions or temporal strings (Anderson 1990; Kosslyn 1980). Within this actor perspective, knowledge consists of representations and learning consists of the change and conversion of representations and resulting behavior. This perspective is in line with the received view within cognitive science (Newell 1982; Newell, 1990; Posner 1989; Pylyshyn 1984; Stillings et al. 1995). In classical cognitive science mental representations are based on perceptions and reasoning and lead to actions. I follow this perspective.

Knowledge, in contrast to data and information, is tightly connected to the person who has the knowledge (Jorna & Simons 1992; Schreiber et al. 2000). However, knowledge itself is not something that is ready made in someone’s cognition (Newell 1990). It has to be mentally restructured and constructed repeatedly. That is also the reason that grasping or to lay a hand on knowledge in content is so difficult or in form. Formulated more dynamically, the relation between data, information and knowledge means that a person (a human information processing system) receives data and with the knowledge he or she has, data becomes information, which in turn changes the knowledge of the interpreting person.

Let me continue 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 independent entities (Allport 1962). Daft (2000), for example, says that “organizations are social entities that are goal directed, are designed as

deliberately structured and coordinated activity systems and are linked to the 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 more general terms an organization can be defined 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 can be integrated in tasks that, in turn, are constituting elements of processes (Gazendam 1993; Thompson 1967).

The returning cornerstone in definitions of “organization” 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 the collection of action sequences - the executing entity is often neglected. A process needs a material carrier. A process runs on something, just like software runs on a computer. In production environments the carriers are often 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 to see, however, that the details and the interpretation of what the employees are and what sort of mental and cognitive mechanisms are involved in performing tasks are often vaguely formulated. The same holds for the realization and interpretation of what is called the coordination mechanisms in an organization. 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, 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.

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 (and an interpretation) in the eyes of (intelligent) interacting actors.

This fundamental cognitive interpretation of the building blocks in an “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 actors with representations and interpretations 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 metaphorically have meaning. 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 actors and coordination mechanisms. Although an actor principally refers to a human individual, it might and will in the (near) future also include software actors (or agents), which may develop into intelligent information and knowledge processing entities.

3. Knowledge and knowledge types

The various aspects of knowledge - discussed in section 2 - make it almost impossible to define types of knowledge unambiguously. Traditionally conflicting epistemological, psychological and cultural categories can easily be distinguished. To avoid 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) sensory, b) coded, and c) theoretical knowledge. This categorization 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 the knowledge **type**.

The first type is about **sensory** (often, but unjustly, called: tacit) 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 made problematic. Art confronts us with contradictory signs and forces us to find coherence. The 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.

The one-dimensional representation underlies what Michael Polanyi has coined as “personal knowledge” (Polanyi 1966). He describes the semiotic process involved in this (sensory or) tacit knowledge as being “aware of that from which we are attending to another thing, in the appearance of that thing” (p. 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”(p. 16). This type of knowledge cannot 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. Sensory knowledge can be very rough, but can also be very detailed. 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 sensory 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 two-dimensional 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 are the basic processes in this phase of semiosis. Externalization and diffusion require 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 the second dimension presupposes the sensory one. Effective communication depends on a mixture of words and gesture, text and example. Partners do not need to be co-present. Basic knowledge at this level, therefore, is social and communicative knowledge, needed for the decision making that underlies all coding (Choo 1998).

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 sign systems (scores) are more strongly coded than natural languages. At the lowest level of codification, codes tend to dissipate into concrete, that is, one-dimensional sensory knowledge. Therefore, in the use of images and metaphors, coded knowledge comes closest to the non-coded concrete knowledge of the first dimension. 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 structural 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 (sensory) 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. It is the result of answers to the ever returning question: why is so and so the case? Knowledge may be discovered, but it may also be “invented”; that’s why it is about 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 theoretical 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 may be formulated. One such a differentiation is in terms of chains of answers to the question why. The longer the chain, the more abstract the theoretical knowledge is.

Based on Boisot (1995) we developed the so called Knowledge Space (van Heusden & Jorna 2001) for the different types of knowledge (see figure 1: the K-Space). Sensory knowledge is on the horizontal axis. This knowledge is not yet coded, nor abstract, and ranges from the very rough to the highly detailed. In the horizontal plane, then, we find coded knowledge. But codification presupposes sensory knowledge and therefore the horizontal axis is part of this plane. In the

three-dimensional cube, finally, we included all kinds of theoretical knowledge, ranging from the concrete to the abstract. Again, as theoretical knowledge presupposes coded and sensory knowledge, the two axes are also part of the theoretical cube. Movements through the knowledge space can now be schematized as movements along the one-dimensional linear axis of sensory knowledge, movements through the two-dimensional plane of codification, and, finally, movements through the three-dimensional theoretical space.

One can schematize different learning processes within this scheme: the learning of a skill means moving along the sensory knowledge axis. The learning of codes implies moving through the codification plane, eventually together with a movement along the sensory knowledge axis. The learning of abstractions means a movement upward, eventually in combination with two other movements toward the right end of the sensory knowledge axis and the far end of the codification plane.

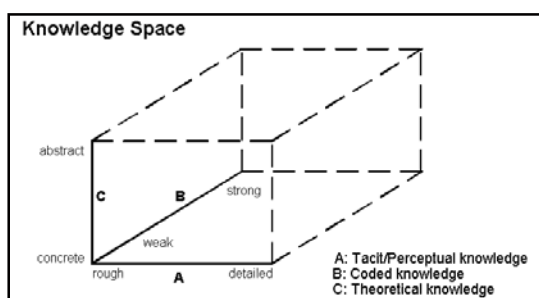


Figure 1 1: The Knowledge space

In reality sensory, 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 that in turn builds upon sensory knowledge. This means that even if the dominant type is theoretical, sensory knowledge is always present.

4. Knowledge types and organizational forms

A discussion about organizational forms is about coordination, cooperation and the design of organizations. It is not about the primary process within the organization. Primary processes are about what an organization produces, yields or brings forth. Examples are hospitals that in treating and curing patients produce health or food processing industries that produce, for example, canned food or custard. They need specialized knowledge of the respective domains for the execution of the primary processes. The way these primary processes are structured and interrelated concerns the organizational processes, also called the secondary processes (Porter 1985).

The organizational processes can be realized in three different ways. First, they can be mixed up or integrated with primary processes. In that situation coordination of machines or operations rooms cannot be separated from primary processes. Coordination, cooperation and structure are constituting elements of primary processes. Secondly, they can be lifted out and be separated from primary processes. These are what I would like to call separated organizational processes. They can be considered as helping, coordinating or servicing processes. Mostly, the organizational processes are performed in separate units or departments. Thirdly, to make things

even more complicated, organizational processes can be completely cut off from the original organization and can be put into a new organization or department. Then their primary process is the execution of organizational processes. I call these second order primary processes. For the line of reasoning it does not matter whether we are talking about integrated organizational processes, separated organizational processes or second order primary processes. For reasons of clarity I will only refer to the organizational process separated in units or departments.

Organizational processes can be described in terms of their constituting tasks. Examples of these tasks are control, planning, administration, monitoring, communication, maintenance and to a certain degree contracting (Daft, 2000). These tasks are executed by (groups of) individuals using knowledge in terms of content and form or type. My main interest in combining organizational forms and knowledge types is **not** in the content of the organizational tasks, but in the types of the knowledge that can be discerned. As indicated in section 3 the types of knowledge are sensory, coded and theoretical. Although in practice all types of knowledge exist for every individual, it does not mean that uniform distributions exist. It is to be expected that one type is dominant over the others with regard to the various tasks.

The determination of dominance of knowledge type for one individual can also be applied to all individuals, active in the organizational process. It can also be determined for the separate tasks out of which the organizational process exists, that is to say for planning, contracting or administration, separately. We then have three possible orientations to look at the distribution and dominance of knowledge types. First, we can take one task as part of the organizational process and determine for all individuals involved the dominant knowledge type. Second, we can look at one individual, executing various tasks within the organizational process, and determine the overall dominance of a type of knowledge. Third, we can generalize over tasks and individuals and determine the distribution and dominance of knowledge types in the organizational process in general. For reasons of brevity I will neglect the level of one task and one individual. I will only look at the organizational process at large. Theoretically, eight possible combinations of the presence and absence of the three knowledge types can be determined. However, the absence of any dominance of knowledge type is hardly realistic. Therefore, seven combinations are left, ranging from sensory (+), coded (+) and theoretical (+) to sensory (+), coded (-) and theoretical (-) knowledge. We should keep in mind that plus (+) means dominant (and not: present) and minus (-) means subordinate (and not: absent).

For the moment we now turn away from the knowledge types 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. Examples 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 (1983) 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 fief, 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, reactor; 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 clans are based on trust. Whatever categorization is taken, I find it remarkable that types of knowledge are not mentioned or used as an interesting dimension to distinguish organizational forms. For that reason I hypothetically combine organizational forms with the dominance and distribution of knowledge types in executing organizational tasks and not in executing primary tasks.

The question is how do organizational forms fit to the distributions and dominance of types of knowledge. Below (Table 1) the combinations of dominance of knowledge type and organizational form are presented. The level of analysis is the organizational process. More detailed determinations can be made for the constituting tasks within the organizational processes and for the individual actors. 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 various combinations, from clan (s +; c -; th -) to market (s +; c +; th +).

A clan consists of a limited group of actors that cooperate on the basis of trust, sometimes justified by family or very close friendship relations. Boisot (1995, p. 259) says that “the term clan refers to a non-hierarchical group of limited size transacting on the basis of shared intangible knowledge and values.” This values are implicit and well-known by the members of the clan, but they are very difficult to formulate. Clans often are small and local, which means that different clans have different interpretations of what trust, loyalty, responsibility and obedience mean. If a clan is large, it normally consists of sub-clans, because of the requirements of physical presence or proximity. The organizational process, rooted in trust and loyalty, does not work in impersonal relations. This does not mean that clans do not use coded knowledge, of course they do, but the interpretation of the codes is guided by knowledge of the sensory type. Theoretical knowledge is largely absent. Questions and explanations of “why governance and coordination are what they are” are not posed nor given. The knowledge type distribution is: s +; c-; th -.

The divisionalized form is only one of the many structures where sensory and coded knowledge are dominant and theoretical knowledge is subordinate. In a divisionalized form the middle line (in Mintzberg’s (1983) terms) is responsible for the development of new business and the control of operations. Often within the larger organization divisions are formed that operate mainly independently, but also have to communicate with other divisions. The organizational process to coordinate, cooperate and communicate is by means of rules and procedures which are often available and used in coded form. Because the divisions belong to a larger organization and because the coordination within the division requires personal knowledge, sensory knowledge is also dominant. The more autonomous the divisions are the less dominant coded knowledge becomes. The knowledge type distribution is: s +; c +; th -.

A very good example of the situation where coded knowledge alone is dominant is the machine bureaucracy. (Machine)bureaucracies are famous for their self-willed search after procedures and guidelines. Everything within the organizational process has to be coded, otherwise it is not suitable and usable. Sensory knowledge is avoided and if it turns up it will be converted into coded knowledge. Theoretical knowledge is also absent because the rules are so to say self-evident. Explanations in terms of theories, models or scientific regularities or laws are not used. Often these theories are considered as undermining the procedures and rules formulated in codes. The knowledge type distribution is: s -; c +; th -.

In a professional bureaucracy (Mintzberg 1983) the operational core consists of highly trained and well-specialized professionals. Many of them may have an academic background. This means that the organizational processes of coordination, control and planning are executed in close relation to the internal structure - the primary process - of the professions. The knowledge they use is coded in the sense that it is represented and documented in rules, procedures and scripts. The knowledge is also theoretical because in answer to “questions why”, explanations, theories and “structural necessities” can be formulated. Very little knowledge is sensory, which can be illustrated by the long explicitly structured training period the novices in this kind of 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. The knowledge type distribution is: s -; c +; th +.

In organizational studies (Sorge & Warner 2001) no clear-cut organizational form matches the dominance of sensory and theoretical knowledge. In this situation coded knowledge is subordinate. If we search for organizational situations where this combination is applicable the most striking example is a Research & Development (R&D) unit. The dominance of theoretical knowledge is clear in such units, because the development of theories is the reason for their existence. However, much of the knowledge that is developed is immature, provisional and tentative. This means that codification may be the result or the outcome of the research, but it is not the knowledge type by which the organizational process works. Everyone working in university research is familiar with the tension between the real research attitude (sensory and theoretical knowledge) and the red tape (coded knowledge) of the university officials. The sensory nature of knowledge is relevant because oral explanations, demonstrations, intuitive insights and sophisticated imitation are essential in hypotheses and educated guesses. The knowledge type distribution is: s +; c -; th +.

Concerning the dominance of theoretical knowledge it is very difficult to match this with one organizational form in particular. It should be an organization where theories dominate the coordination, cooperation and communication of the organization. Sensory and coded knowledge are of course present, but they are guided by the true theoretical insights. The only real organization that comes close to this division of knowledge types is, I guess, the Roman Catholic Church. It is relevant not to treat theoretical knowledge as equivalent to scientific knowledge. Scientific knowledge is an example of theoretical knowledge, but not the other way around. Although the Bible as coded knowledge is very important for the Roman Church, the interpretation and extension of this document is guided by theoretical knowledge. The Islam could also be an example, but in contrast to the Roman Catholic Church the Islam does not have a centralized authority with regard to the doctrine. This example also makes clear that other

principles besides the division and dominance of knowledge types cannot be neglected. The Roman Catholic Church has a hierarchical structure, whereas the Islam has a network structure (Beinin & Stork 1997). The knowledge type distribution is: s -; c -; th +.

A market is characterized by many autonomous organizations. The coordination as a organizational 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 organizations are said to be equivalent, but in practice they are very different. The organizations internally work on the basis of local information, whereas external comparison is done in terms of prices. Because the organizations are so diversified in reality, it implies that an organization with much sensory knowledge might compete with an organization with much coded and theoretical knowledge and that two organizations with both dominant coded knowledge may be negotiating with one another. The variety of organizations, involved in the market, explains the presence of all types of knowledge (s +; c +; th+). It also explains the complexity of market situations. One could also reason the other way around and call a market a coordination, cooperation and communication structure without the dominance of any kind of knowledge (s -; c -; th-). Principally it does not matter whether none or all knowledge types are dominant. The knowledge type distribution is: s +; c +; th +.

The various organizational forms are interpreted in relation to the organizational processes. The forms are idealized in relation to the division and dominance of the knowledge types (see table 1 for the overview). Just as with any other description of organizational forms and structures, organizational practices are more opaque. If one goes one level deeper into the tasks that are the building blocks of the organizational processes, it might be the case that for control coded knowledge is dominant in the organization, whereas for planning in the same organization sensory knowledge is dominant. In order to test the fit of organizational forms and knowledge types it is necessary to collect data at the level of tasks, task execution and individual actors.

In discussing the organizational forms and the knowledge types the role of the various kinds of actors has remained in the background. However, the actor is the entity where knowledge, organization, task and process come together. An actor as a (human) information processing system (Newell 1990) has knowledge, forms the organization, communicates with other actors and executes tasks.

Sensory	Coded	Theoretical	Organizational form
+	-	-	Simple Structure; Adhocracy: Clan; Fief; Family
+	+	-	Divisionalized form
-	+	-	Machine bureaucracy
-	+	+	Professional bureaucracy
+	-	+	R&D department; University research
-	-	+	Not applicable
+	+	+	Market (but organizational processes are also external)

-	-	-	Not applicable
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Table 1: Organizational forms in terms of the dominance of knowledge types for organizational processes ((+) means dominant and (-) means subordinate; theoretical presupposes coded which presupposes sensory).

5. Conclusion: knowledge management and organizational forms

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

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

I argue that the above argument gives an operationalization of knowledge management with respect to the tasks that constitute the organizational process. The same can be done for the primary processes, but that is not the issue, here. If knowledge is used in the organizational process, and no one would deny that, than in order to be managed that knowledge has to become observable and “measurable”. The point I tried to make, here, is that more than just random matches seem to exist with organizational forms. I repeat that the above argument is not (yet) based on empirical investigations. That is the next step that has to be taken. In the following propositions I want to assert how important it is to explicate the relevance of actors, their cognition, the tasks they execute (1) and its implications for knowledge management (2). After that I will make some remarks regarding organizational processes (3) and I will point to the empirical research we started into knowledge types and innovation (4) and knowledge types and the implementation of software for planning support (5).

1. Actors. Our basic starting point is that an organization does not exist without actors with cognition and action. Leaving aside for the moment, the development of software agents, I want to state it explicitly: no human information processing systems, no organization. The key terms in humans as information processing systems are cognition and representation.

2. Knowledge management. As I argued earlier (Jorna 1998) there are three basic interpretations of knowledge management. First, knowledge management can be seen as a kind of human resource management. In that case the discussion is about the assessment of skills, abilities and the intellectual power of people. A second perspective sees knowledge management as a kind of upgraded information management. In that case a technical interpretation is given of the relation between humans (and their knowledge) and information systems, database systems, decision support systems and knowledge systems.

The third interpretation of knowledge management takes actors and cognition as its starting point and is about cognition, representations and presentations. Basically, the terms in this perspective are related to signs and symbols (systems) and the categorization of kinds of signs/symbols. This is important because until now all actors are human actors. In the very near future the “good old” physical office will be replaced by more or less intelligent computer systems. Perhaps, it will take another ten or twenty years, but the office of the future will be a combination of our own cognition and the power of intelligent (artificial) actors. Knowledge will be realized by the way we are able to handle the intelligence of various actors that are able to get information from all over the world. That information, however, still has to be interpreted by us. Forms of giving expression to this information are important in three ways. First in relation to what we know of ourselves, second in relation to the interpretation of this information in the sense of what it is, where it stands for and which action has to be taken and third in relation to the transfer of interpreted information to others. Adequate presentations and representations are indispensable in realizing this.

It seems that the debate about knowledge management functions as the well known box of Pandora. Knowledge and learning are complicated matters and it is not easy to grasp them. However, there also is a lack of conceptual frameworks to deal with these non-physical entities within management and parts of information science. Of course, this depends upon the meaning of “knowledge management”. If knowledge management means human resource management with a strong emphasis on the assessment of the skills and competencies of staff it is just old wine in new bottles. The same can be said if knowledge management means (advanced) information management. As soon as knowledge management is about (the control of) the type and content of knowledge and as soon as “strange” phenomena like individual people with their minds and cognitive architectures are central - and I think this is the case in discussions about knowledge and learning - it automatically leads to questions about a conceptual framework to grasp these entities. A first attempt to formulate such a framework was discussed here.

3. Organizational processes. In organizations primary as well as organizational (or secondary) processes are performed. If organizations are too large the organizational processes often are separated into different departments and units, such as planning, control and budgeting units. I argued that the design of the organizational processes, in terms of tasks and the accompanied knowledge types, is related to organizational forms. This analysis does not exclude another kind of analysis where the subject of research is the primary process in an organization. For example, in a specialized cancer hospital where the primary process is curing and caring, the tasks that constitute the primary process may be studied in terms of the distribution and dominance of knowledge types. Such an analysis will give insightful information about better ways of using knowledge, of communicating, of explicating knowledge and of implementing various kinds of information systems.

4. Innovation. The assessment of knowledge types also gives an indication of the duration and speed of the implementation of innovation. Innovation as a radical change in, for example, ways of working, products or services is bounded by the types of knowledge that are present in an organizational structure. If types of knowledge are “wrongly” distributed or the “wrong” one is dominant, the innovation process may be strongly impaired. Presently, empirical research with questionnaires and observation schemes is going on in the Royal Dutch Army (van der Voort 1999) in which for two large units, the so called “Whites” (office people) and “Greens” (battle

people), the different implementation rate and scope of ITIL (a method for information provision) is explained by different distributions and dominance of knowledge types on the various tasks for the various actors.

5. Software and Information Systems. Knowledge management also is about the implementation of various kinds of information systems - artificial actors if they are sufficiently intelligent - having interdependencies with human actors. Concerning the implementation and use of information systems, the unspoken assumption is that knowledge is or can be coded. However, in communicating and working with software, humans still have and use knowledge that for a larger part is sensory. Looking at the level of tasks, it can easily be determined why certain computerization projects fail or last longer than expected. We started a longitudinal empirical research (Sjarbaini 2001) in which we follow the change in the distribution and dominance of knowledge types during the implementation and use of planning support software. More than thirty planners are questioned and observed regarding their knowledge types for three sub-tasks of planning. Three what we call knowledge snapshots are taken: a) before the implementation of the planning software, b) during the implementation and training with the software and c) half a year later. We expect that for certain sub-tasks the knowledge will change from sensory into coded, whereas for other sub-tasks sensory remains sensory. The last situation will hamper the successful use and acceptance of software (Van Wezel & Jorna 1999).

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

Lukes' forms (by Caritat)	Sensor y	Code d	Theoretica l
Militaria	-	+	-
Utilitaria	-	+	-
Communitaria	-	+	-
Proletaria	-	+	-
Liberitaria	-	+	-
Egalitaria	-	+	-

Table 2: Lukes' forms as dominant types of knowledge

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