

University of Groningen

The social cognitive actor

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Document Version

Publisher's PDF, also known as Version of record

Publication date:

2006

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Helmhout, M. (2006). *The social cognitive actor: a multi-actor simulation of organisations*. [Thesis fully internal (DIV), University of Groningen]. s.n.

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CHAPTER 3

The Social Actor

THE previous chapter has explained the field of Multi-Agent Systems. In the discussion about Multi-Agent Systems it has become clear that we need a hybrid agent, one that is cognitive, reactive and social, i.e. the cognitive agent has to be physically as well as socially situated in the environment. In the next chapter, we explain what is understood by a cognitive actor and a reactive actor. In this chapter we want to focus on the social level of agency, i.e. the social aspects of an agent, and how the social agent is embedded in the social environment.

The first question that comes to mind is: why is it necessary to study and model a social actor, and what reasons are driving an actor to behave socially? The number of reasons to behave socially is plenty. One of them could be that social behaviour can reduce uncertainty. For instance, the uncertainty reduction theory of Berger and Calabrese (1975) assumes that: "... [] when strangers meet, their primary concern is one of uncertainty reduction or increasing predictability about the behaviour of both themselves and others in the interaction" (p. 100). Hence, when reduction of uncertainty is an intrinsic desire of humans, it requires communication, social interaction and exchange of social attitudes in order to create certain predictions about behaviour of others. Another possible reason for social behaviour is reciprocity (Fehr & Gächter, 2000) or altruism. Altruism could be seen as the reason why self-interested economic utility calculations mostly do not work, i.e. the question is that: "... [] when we help others, [is it] because our ultimate goal is to benefit them, or whether our ultimate goal is always some more-or-less subtle form of self-benefit" (Batson & Shaw, 1991, p. 159). There are many other reasons and apparently there is an indication that there is an intangible aspect in behaviour that can be addressed as a form of social behaviour that occurs between individuals and simply cannot be understood by economic utility calculations alone.

This chapter focuses on social aspects of the actor that enables it to behave socially. These aspects should create the possibility for actors to express social behaviour and become aware that they are not alone, but are also part of a group or society. In other words, the actor does not only live in his own world (internal representation) but also builds up relations with the outside world; with physical, social and cultural objects, actors and groups of actors.

Sociology and social psychology are research fields that focus on interaction between (processes of) individuals and groups. In our research we take social constructivism as a theory that focuses on the understanding of context and social interaction, and the assumption that knowledge creates and is created out of social processes. The second theory we adopt is semiotics that explains how knowledge and its meaning are created and transferred between individuals with the help of signs. And the third theory is cognitive science/psychology, which is discussed in chapter 4.

Social constructivism as a social psychological theory attempts to explain the relation between the individual as part of its society. In our line of reasoning, the theory follows the right direction, however its description is too abstract to transform into a useful social (actor) model that is (directly) applicable for our use in a simulation setting. Therefore, we adopted levels of description as shown in figure 3.1 and discussed in chapter 1. The *intentional level* and *functional level* are concerned with the individual's mind (respectively its intention-and-belief system and the learning/cognitive system); we elaborate more about these levels in the next chapter. The *social level* is concerned with behaviour of groups or being/feeling part of a group; it addresses topics like knowledge of the generalised other, habits of action, social laws, collective action and the overall characteristics of the group. The *semiotic level* describes the use of language, codes and signs existing in a community and used for communication, interaction and negotiation. With help of a signification system and sign production, these signs can be understood and produced by actors. It seems that the semiotic level is a level that is present (as signs) in the community and in the individual as well.

In section 3.4, we will elaborate more about the semiotic level and its connection with the social and individual (intentional and functional) level. Figure 3.1 also shows that the theories (cognitive/social psychology, sociology and semiotics) position or identify themselves with (pay most of their attention to) one of these levels.

We argue that in order to construct a model of the social (and cognitive) actor, we need to understand all these levels of description and corresponding theories. These theories and the social actor will be explained in this chapter except for cognitive science that will be elaborated in the next chapter.

The outline of this chapter is structured in the following way (see also figure 3.1). In section 3.1, we introduce the chapter with social constructivism and argue that an actor socially constructs its world, i.e. the actor builds up representations in its mind about the social and physical world. Section 3.2 argues that an organisation exists by means of a collective social construction and that an organisation can be traced back to representations in the mind of the actors or members of the organisation. In section 3.3, we introduce the social environment

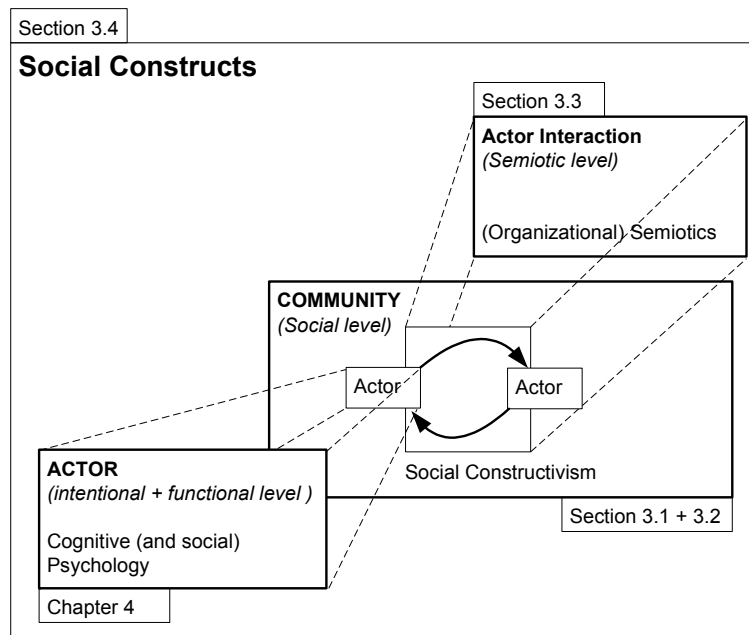


Figure 3.1: Social constructivism and overview of levels and theories.

and introduce the theory of semiotics and communication. We argue that an actor in order to behave socially not only requires the support of a communication process and its communicative functions, but also that such a communication process presupposes a signification system and sign production based on codes. In section 3.4, we start the discussion about the social actor¹ and introduce the generic theoretical framework of social constructs. Social constructs are representations that exist in the mind of the actor, and physically as artefacts in the external world (documents) and can function as coordination mechanisms for the actor in order to exhibit social behaviour. Finally, in section 3.5, we close the chapter with a discussion about the requirements for an actor to exhibit social stable behaviour and argue that representations in the mind of the actor need support from a cognitive architecture; an argument that is more elaborated in the next chapter. In chapter 5, these requirements serve as guidelines for the design and modelling of the cognitive and social actor RBot.

3.1 Social constructivism

The founding principles of social constructivism were established by Mead (1934) and Vygotsky (1962, 1978). Mead analysed the human being as a complex individual who socially constructs the world, itself and other human individuals. The social construction of the world is created by a process of interaction, but what is social construction and what can and cannot be socially constructed?

¹The cognitive actor, as shown in figure 3.1, will be discussed in chapter 4

Chapter 3. The Social Actor

A concrete definition of what social construction is, seems impossible because the term social construction has become blurred by its popularity and overuse in literature for anything that seems worthy constructing (Hacking, 1999). Hacking found out that many authors use a localised view on social construction to raise consciousness for addressing certain problems in our world, e.g. women refugees, homeless people etc. Hacking states that the following will hold for social construction in general:

X[, as a social construct,] need not have existed, or need not be at all as it is. X, or X as it is at present, is not determined by the nature of things; it is not inevitable. . . . X was brought into existence or shaped by social events, forces, history, all of which could well have been different. (Hacking, 1999, pp. 6–7)

Hence, a social construction or social construct can be seen as an invention or artefact (cf. Goodman & Elgin, 1988; Simon, 1996) constructed by interaction between members of a social group or interaction between groups. Products of social construction, such as institutions, gender and emotions are "... social constructs, created, disseminated, and agreed upon by social groups. . ." (Sismondo, 1993, p. 522).

The social constructivist Blumer (1969), a student and follower of Mead, states that Mead started the reasoning about social construction by developing a reversed way of thinking stating that not only human's actions create the (social) world but that also the social world creates the mind and consciousness of the individual human being:

His [Mead's] treatment took the form of showing that human group life was the essential condition for the emergence of consciousness, the mind, a world of objects, human beings as organisms possessing selves, and human conduct in the form of constructed acts. He reversed the traditional assumptions underlying philosophical, psychological, and sociological thought to the effect that human beings possess minds and consciousness as original "givens", that they live in worlds of pre-existing and self-constituted objects, that their behaviour consists of responses to such objects, and that group life consists of the association of such reacting human organisms. (Blumer, 1969, p. 61)

Hence, the assumption is that there is an interdependent relationship between human group life (the society) and the human being itself, because without social interaction with other human beings, we do not get acknowledgement of our existence, our mind and ourselves, i.e. without the others and the (social) act we are unable to construct a reality/society for ourselves. Blumer, as well as Mead base their social psychological theory on concepts like the act, the objects, the social act and society that address how human society is constructed by interaction of individuals. We will discuss these concepts below.

The act Human action is not merely a product of factors that play upon or through the human actor. In social constructivism, the act is constructed by the actor and therefore action will not be formed by simply stating that the response is solely dependent on the conditions of stimuli. Human action and the individual can be represented by the play and the game. The play is often found in children that have for instance invisible imaginary friends, in which the child responds to its own stimuli and becomes aware of itself. On the other hand, in the game, the child must perceive the attitudes of the others that define a relationship between itself and the rest. The organisation of the game is arranged with the help of (in) formal (socially constructed) rules. The game creates the possibility to take into consideration the particular attitudes of other individuals with whom the individual interacts; thereby creating social acts with each of these individuals. After this stage of social interaction, it is possible to organise the others into a sort of unit or community that can be designated as 'the generalized other':

The organized community or social group which gives to the individual his unity of self may be called 'the generalized other'. The attitude of the generalized other is the attitude of the whole community. (Mead, 1934, p. 154)

An example can be seen in how a member of a political party takes on the generalised attitude of that party and consequently speaks or responds in terms of the organised attitudes of that party, i.e. the member feels itself committed to a community and represents thereby that community.

Objects An extreme form of social constructivism assumes that all objects are human constructs and that they do not exist as self-existing entities with intrinsic natures. Hence, any object is a social construct, be it a company, a marriage-contract, an imaginary friend or a rock as long as they are assigned a meaning², or are interpreted by human beings and are therefore part of our world.

According to Searle (1995), the world view depends on our concept of objectivity and the contrast between the 'objective' and the 'subjective'. He proposed two senses of the objective-subjective distinction: the epistemological and ontological objective-subjective distinction. The epistemological distinction is applicable to judgements, in which a judgement is *epistemologically objective* when its truth or falsity is independent of attitudes or feelings of people, and *epistemologically subjective* when it is based on certain attitudes or feelings of people.

²Meaning arises and lies within the field of the relation between the gesture of a given human organism and the subsequent behavior of this organism as indicated to another human organism by that gesture. If that gesture does so indicate to another organism the subsequent (or resultant) behavior of the given organism, then it has meaning. In other words, the relationship between a given stimulus—as a gesture—and the later phases of the social act of which it is an early (if not the initial) phase constitutes the field within which meaning originates and exists. Meaning is thus a development of something objectively there as a relation between certain phases of the social act; it is not a psychical addition to that act and it is not an "idea" as traditionally conceived. (Mead, 1934, pp. 75–76)

The following two statements: (1) "The mount Everest is an ugly mountain" and (2) "The mount Everest is the highest mountain on earth" are examples of epistemological subjectivity and objectivity. The former is a subjective notion of what is beautiful or not and the latter is an objective fact of the 'real' world independent of attitudes or feelings regarding its height. The *ontological* sense of objective and subjective is applicable, not to statements or judgements, but to entities, objects or properties. The moon, for instance, is an example of an *ontological objective* entity; with or without the presence of human beings, the moon will inevitably be there. On the other hand, pain is *ontologically subjective*, because its existence depends on being felt by the subjects itself. The subjective object is always dependent upon the meaning it has for a person or person(s). Such a meaning is not part of the object, but socially constructed (formed and transformed) by the person(s) involved. People are prepared or set to act based on the meaning of an object, e.g. a kitchen knife can be a tool for a cook, but a weapon for a murderer³. Searle refers to the (meaning of a) knife as being an observer-relative object, because it exists relative to the intentionality of the observers and users. On the other hand, the moon for instance is an *intrinsic* object, its existence is independent of the observer and intrinsic to nature, i.e. the mass of or chemical composition is independent of the observer. Simon (1996) refers in a similar way to objects; he states that an object or artefact functions as an interface "between an 'inner' environment, the substance and organization of the artefact itself, and an outer environment, the surroundings in which it operates" (p. 8). An individual not only interacts with objects or artefacts; an individual also interacts with humans (and animals) who are assumed to have an own will and in contrast to objects, the interaction with individuals is of a social nature.

Social act and society The social act is described by Blumer as a "collective form of action that is constituted by the fitting together of the lines of behaviour of the separate participants" (emphasis added: Blumer, 1969, p. 70). In the individual act, the human being depends on its own interpretation of the interaction, whereas in the social act, the human being has to bring its behaviour in line⁴ with the others, e.g. members of a removal company have to align their acts for not breaking anything. The type of interaction can vary from bilateral acts, a marriage, and a trade-contract, towards multilateral acts, e.g. an opera, a company activity, or a government of a country. Because the social act is a collective form that depends on individual actions of each separate individual and each individual develops its own experience over time, the social act is exposed to many uncertainties. The start of the social act can be complicated and when it has commenced, it can be interrupted, abandoned, or transformed. When individuals have given different meanings to what the social act stands for, there is a possibility that they do not act in line with each other, which causes actors to deviate from each other. Hence, social construction can only *support* individuals

³According to the affordance theory (Gibson, 1979), we perceive affordance properties from the knife, i.e. we perceive possibilities for actions: the cook cuts the vegetables and the murderer kills its victim.

⁴We assume that when *social* actions need to be in line with others, it requires a form of coordination (mechanism)

in forming a social act; the diversity of experience and understanding can always give rise to difficulties in a common understanding or meaning. A human society is made up of individuals who have selves or better, are entities with cognitive capabilities for reasoning about the world that surrounds them, i.e. individual action is a construction and not merely a release of stimulus-response behaviour. Individuals accomplish social acts that "... [] consist of the aligning of individual actions, brought about by the individuals' interpreting or taking into account each other's actions" (Blumer, 1969, p. 82). The process of alignment of individual behaviour towards a coherent act can be seen as the start of the social construction of a formal organisation or institution. However, in order for an organisation (or institution) to exist in a society and formally be accepted, it needs to be explicitly constructed in a negotiation process. After the establishment of an organisation, it can function as a unit for storing documents that serve as guidelines for performing social acts. In the following section, we discuss the organisation and society as carrier and provider of products of social construction.

3.2 Social construction of organisation and society

In the previous section, we have stated that the social act is a mutual effort for coordinating activities. Such a social act or a set of interdependent social acts, observed as a coordinated activity, constitutes as a community, or according to Mead (1934):

[A community]... is dependent upon individuals taking the attitude of the other individuals. The development of this process... is dependent upon getting the attitude of the group as distinct from that of a separate individual-getting what I have termed a "generalized other". (p. 256)

Hence, the moment we detect a 'generalized other', we discover a community that conforms to certain ways of conduct or habits of action that exist in that community. A community can be an informal community or a formally acknowledged community, which we can refer to as an organisation. Such a community or organisation delivers a common response, from society to individuals of that society, or as Mead (1934) states:

There are, then, whole series of such common responses in the community in which we live, and such responses are what we term 'institutions'. The institution^[5] represents a common response on the part of all members of the community to a particular situation. (p. 261)

Mead does not discuss the *cognitive* aspects of individuals, and we are aware that today "social cognition has become the dominant perspective in social psychology (Schneider, 1991)" (Tenbrunsel, Galvin, Neale, & Bazerman, 1996, p.

⁵Later on, see section 3.4.3, we give a better description of institution, i.e. according to Rawls (1971) an (explicit and formal) institution is a public system of rules, which defines offices and positions with their rights and duties, powers and immunities.

315). Social cognition studies interactions between people, and how people make sense of others, but in social cognition, in contrast to social constructivism, the emphasis is on how cognitive processes influence social behaviour (Fiske & Taylor, 1991). In this dissertation, see chapter 4, we apply this cognitive approach in studying social interaction between individuals, i.e. we adopt theories of cognition—a cognitive architecture—to model and study how cognitive plausible actors influence the behaviour of others.

Taking into account cognition, we can state that the organisation exists as a formally acknowledged entity that is maintained by interaction between individuals—its members. But does this statement claim that an organisation is a tangible (intrinsic of nature) object or/and that an organisation is an intangible (observer-relative) object, i.e. does an organisation 'really' exist? Recall that for an object to be ontological objective it should still be existent in the absence of minds and to be ontological subjective it should depend on minds, and to be epistemological objective, the judgement about facts should be independent from attitudes or feelings about these facts. We give the following example of the five dollar bill to show how an organisation should be thought of as an object.

For example, for some kind of physical object to be money, we as society must think of it as money. These attitudes are partly constitutive of its being money. The claim that I have \$5 in my pocket is epistemologically objective. It is made true by the money being there, whether or not any particular person knows about it. On the other hand, there is a sense in which this fact only exists as a result of collective human acceptance. That is, whereas it holds independent of beliefs or attitudes, it is not independent of all human cognition. It is thereby ontologically subjective. (Meckler & Baillie, 2003, p. 281)

In this example, when we substitute money with organisation, it becomes clear that an organisation is epistemologically objective and ontologically subjective, except that I do not have the organisation in my pocket, or do I?

An organisation is an entity to which people collectively have assigned a function to, i.e. the tax office its function is to collect money from people for the public good, and the coal mine has the function to deliver coal to industry and households as a source of energy. An organisation exists merely because we collectively agree it to be an organisation, i.e. the organisation does not exist in the absence of such an agreement (Meckler & Baillie, 2003). Therefore, it is in this sense that the organisation is socially constructed and ontologically subjective.

In this dissertation, we adopt this constructivist point of view in which the organisation exists as a social construction created, observed and acknowledged by individuals. The reason is that coordinated activities such as organisations in MAS are explained by the assumption that organisations exist based on social interaction between autonomous agents. Further, we assume that an organisation can be traced back to representations (in the mind of actors) that structure the interaction among people, thereby demarcating the group of people that are members of the organisation (Van Heusden & Jorna, 2001).

In the research conducted by us, we state that the organisation exists out of several actors, producing and perceiving symbols and/or signs to interact with each other. The organisation is a constructed reality as long as the interacting actors and their teamwork exist (Gazendam & Jorna, 1998), i.e. organisations exist as long as there are representations in the mind of the ones—insiders or outsiders—who perceive(d)⁶ the organisation. Social constructivism creates the awareness that organisations exist out of individuals who together construct that same organisation by symbolic interaction. Social constructivism, concerned with symbolic interaction and meaning, is closely linked with semiotics. The discipline of semiotics concerns signs⁷, and describes how the meaning of signs depends on—and is transferred during—the social interaction between individuals.

3.3 Social Environment and Semiotics

What brings together social constructivism and semiotics is the *meaning* of an ‘object’. While social constructivism is focused on the (social and cultural) construction of the meaning of the object for the individual, *semiotics* is concerned with the *creation, use* and *transfer or communication* of the meaning with the help of *signs*, i.e. semiotics studies all cultural processes as processes of communication and signification (Eco, 1976).

Semiotics is concerned with the construction of signs in the environment, a signification process through which certain systems of signs are established by virtue of social and cultural conventions or constructs. Conventions or constructs such as books, laws and contracts can act as a memory aid for enhancing (situated) cognition of individual and organisation.

The transfer and the construction of meaning—in which the individual is a sign producer as well as an interpreter—are influenced by the environment of the individual that puts constraints on the processing of available signs. Besides that, the individual is limited in the range of signs it can perceive, determined by the biological make-up of the individual itself.

3.3.1 Umwelt

The individual determines its behaviour patterns based on the environment or semiotic *Umwelt* in which it is situated. Such a semiotic Umwelt is described by Von Uexküll as follows:

⁶For example, when an organisation bankrupts, it does not formally exist anymore. However, its informal existence depends on the moment that all actors who (have acted based on the formal existence of the organisation and perceived that organisation) have no beliefs or memory about its existence anymore.

⁷*Semiotics is concerned with everything that can be taken as a sign. A sign is everything which can be taken as standing for something else. This something else does not necessarily have to exist or to actually be somewhere at the moment in which the sign stands in for it. Thus semiotics is in principle the discipline studying everything which can be used in order to lie. If something cannot be used to tell a lie, conversely it cannot be used to tell the truth: it cannot in fact be used ‘to tell’ at all. (Eco, 1976, p. 7)*

[]. . . first blow, in fancy, a soap bubble around each creature to represent its own world, filled with the perceptions which it alone knows. When we ourselves then step into one of these bubbles, the familiar meadow is transformed. Many of its colourful features disappear; others no longer belong together but appear in new relationships. A new world comes into being. Through the bubble we see the world of the burrowing worm, of the butterfly, or of the field mouse; the world as it appears to the animals themselves, not as it appears to us. This we may call the phenomenal world or the self-world of the animal. (Von Uexküll, 1957, p. 5)

Von Uexküll (1957) gave an example of the tick to illustrate the concept of *Umwelt* and how the individual is embedded in its world through *functional circles* (see figure 3.2). Sequential circles of interaction between the tick as a subject (as a *meaning-utilizer*) and a mammal as its object (and *meaning-carrier*) show the change of functional circles in its *Umwelt* (Ziemke & Sharkey, 2001).

- (circle 1) The tick awaits in the bushes for a mammal that passes by closely enough to receive perceptual cues (*Merkmal-Träger*) of butyric acid that are transformed into perceptual signs (*Merkzeichen*) which are processed by the perceptual organ (*Merk-Organ*). Next, the effector organ (*Wirk-Organ*) produces effector signs (*Wirkzeichen*) that creates effector cues (*Wirkmal-Träger*). This results into signs that are sent towards the feet in order for the tick to drop onto the mammal.
- (circle 2) The shock of landing terminates the first circle and serves at the same time as the perceptual cue that makes the tick move towards the skin.
- (circle 3) When the tick receives the heat of the skin of the mammal, the tick terminates the previous circle and the heat starts to become a perceptual sign in the tick's *Umwelt*. Finally, after producing the effector signs, the biting motions are produced.

Stamper (1973) developed the 'information field' independently of the concept of 'semiotic *Umwelt*', but the information field can be seen as the form that the semiotic *Umwelt* takes for a person living in a community. "Because each person generally lives in several communities (family, work, religious community, club, country, and so on), the semiotic *Umwelt* for a person is composed of all the information fields bound to the communities he or she participates in" (Gazendam & Liu, 2005, p. 7).

From a semiotics point of view, the functional circles describe a circular stimulus-response system that reacts on *signals*⁸ or according to Sebeok (1994)

⁸A signal is a pertinent unit of a system that may be an expression system ordered to a content, but could also be a physical system without any semiotic purpose... A signal can be a stimulus that does not mean anything but causes or elicits something; however, when used as the recognised antecedent of a foreseen consequent it may be viewed as a sign, inasmuch as it stands for its consequent (as far as the sender is concerned). On the other hand a sign is always an element of an expression plane conventionally correlated to one (or several) elements of a content plane. (Eco, 1976, p. 48)

3.3. Social Environment and Semiotics

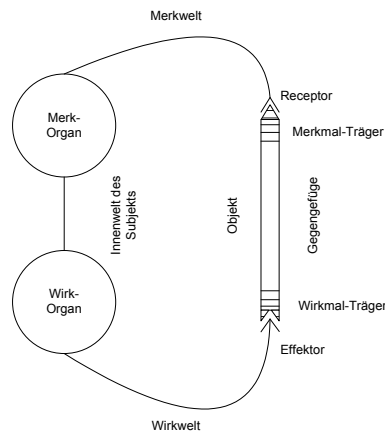


Figure 3.2: Functional circle (adapted from Von Uexküll, 1957).

this describes the Primary Modelling System (PMS). Besides that, Sebeok distinguishes also a Secondary Modelling System (SMS).

All the animals paleontologists classify generically as Homo, and only such, embody, in addition to a primary modelling system. . . , a secondary modelling system, equivalent to a natural language. The difference amounts to this: while the Umwelten of other animals model solely a (for each) 'existent world', man can, by means of the secondary system, also model a potentially limitless variety of 'possible worlds' (containing sentences with alethic, deontic, or epistemic modalities). (Sebeok, 1996, p. 106)

The last and third modelling system Sebeok discerns is the Tertiary Modelling System (TMS): a model that describes abstract forms of semiosis that use conceptual symbolic representations (Gazendam, 2003). The complete system is a three-layered system: the TMS is grounded in language or speech (the SMS) and the SMS is grounded in the PMS.

The process of semiosis⁹ and the unique ability of humans to consciously manipulate signs create the possibility for humans to construct worlds apart from nature and direct experience (Cunningham, 1998). The importance of signs in creating the Lebenswelt—the human Umwelt—lies in their creative power for infinite representation and meaning-making, or unlimited semiosis (Eco, 1990); a recursive process in which a sign refers to another sign and so on (Deely, 1990). Culture and society are therefore a collective construction, time after time reconstructed by the individual in interaction with others. The interaction with others is achieved by the production of signs, e.g. using sounds as a carrier, and is based on a process of communication. In the following section we discuss this interaction with help of processes of communication and semiotics.

⁹Semiosis is an activity, conduct or process by which an actor (part of a culture) produces signs and/or attributes meaning to signs, the process of meaning-making (cf. Chandler, 2002; Peirce, 1931).

3.3.2 Communication and Semiotics

Social construction requires the actor to interact and *communicate* socially with others in order to create representations in their mind that are also embedded in the social environment and shared with other actors. Communication is the practise of social relationships, and is central to the life of our culture, i.e. communication is social interaction through messages (Fiske, 1990).

Fiske states that there are two main schools of communication. The first school sees communication as *transmission of messages*; it is concerned with efficiency and accuracy of messages and sees communication as action or *communicative acts*. The second school is concerned with the *production and exchange of signs*, the discipline of semiotics and is considering '*works*' of communication, i.e. communication not only exist merely out of communicative actions, but the actor possesses a signification system (and therefore a theory of codes) and sign production as well (Eco, 1976).

The interpretation of social interaction between the two schools is different. The former sees influencing the behaviour of others as social interaction and focuses on the communication process, while the latter states that individuals involved in interactions are members of a culture or society and that messages are interpreted by the individuals based on their cultural experiences and shared understanding of these messages. Hence, the difference is that scholars of the first school do not interpret or evaluate the meaning of messages with reference to relevant codes in order to emphasise the *semiotic* (or social) codes involved, and thus do not highlight the social factors (Chandler, 2002, p. 175). In this dissertation, we adopt semiotics as a theory for communication¹⁰, a more complete theory that gives attention to the relation between text, codes and culture, and which covers the aspects of communicative acts as well.

Social interaction does require a social or cultural setting that enables the communication of meaning through signs in the form of sounds, gestures, or written symbols. The knowledge to generate and understand signs consists of a system of signification and a system of sign production (Eco, 1976). Semiotics states that in order to understand the meaning of a sign, the sign has to depend on a code or convention for communication (Jakobson, 1971). Hence, when actors interact, codes provide a medium by which mutual understanding and transaction of meaning between these actors is possible. Chandler (2002) states that:

[T]he conventions of codes represent a social dimension in semiotics: a code is a set of practices familiar to users of the medium operating within a broad cultural framework [and...s]ociety itself depends on the existence of such signifying systems. (p. 148)

An actor that participates and understands the meaning of signs based on such a convention identifies itself as a member of a society.

The theory of codes or signification system distinguishes different types of codes, such as social codes (e.g. speech or gestures), textual codes (e.g. scientific

¹⁰We also adopt semiotics as the basis of humans as information-processing entities or cognitive and symbol manipulating actors (see chapter 4).

codes, music) and interpretative codes, e.g. perceptual codes. Codes as systems of signification are rules or sign-functions that establish the correlation of an element of the expression system with the element of the content system. Such a signification system is “an *autonomous semiotic construct* that has an abstract mode of existence independent of any possible communicative act it makes possible” (Eco, 1976, p. 9). Whereas Eco refers to a signification system as an autonomous semiotic construct, we would rather refer to it as a *social construct*—a social signification or coding system. The social construct is based on organisational semiotics, social constructivism and cognitive science; we will discuss the social construct in the next section

In this section, we want to address the transmission of messages between actors and the aspect of sign production¹¹ that concerns communicative or speech acts. The transmission of messages between addresser and addressee is often portrayed with models of communication processes that describe “the passage of a signal (not necessarily a sign) from a source (through a transmitter, along a channel) to a destination” (Eco, 1976, p. 8). A well-known and often used model is the model of Shannon and Weaver (1949), but although its simplicity is its strength, the model is restricted because it neglects the importance of codes and social context. The model of Jakobson (1960), based on the work of Bühler (1934), addresses the importance of codes and social context and moreover, he states that any act of communication should contain six constitutive factors in order to communicate efficiently and effectively, i.e. (as cited by Chandler, 2002, p. 177):

The *addresser* sends a message to the *addressee*. To be operative the [*message*] requires a *context* referred to (‘referent’ in another, somewhat ambivalent, nomenclature), seizable by the addressee, and either verbal or capable of being verbalized, a *code* fully, or at least partially, common to the addresser and addressee (or in other words, to the encoder and decoder of the message); and finally, a *contact*, a physical channel and psychological connection between the addresser and the addressee, enabling both of them to stay in communication. (Jakobson, 1960, p. 353)

Jakobson argues that these six factors are connected to functions of language, see table 3.1.

Besides that, he argues that “these *primitives* (as given by each of the factors and functions) must be (1) present in every speech act and (2) viewed as constantly renegotiating internally their level of importance in any and all speech acts” (Andrews, 2003, p. 18), i.e. although there is a distinction in six functions, verbal messages that fulfil only one of these functions are rare and hardly found (Jakobson, 1960). Sebeok (1991) complements the model of Jakobson, by stating that the *context* is the factor within which the entire communication act is embedded, i.e. the producer and receiver of signs who are involved in the communication act, have their own (built-up) internal represented context—in

¹¹For the interested reader, more aspects of sign production, such as a typology of modes of sign production and so on, are elaborated by Eco (1976)

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<i>Type</i>	<i>Oriented towards</i>	<i>Function</i>	<i>Example</i>
Referential	Context	Imparting information	It's raining
Expressive	Addresser	Expressing feelings or attitudes	It's bloody pissing down again!
Conative	Addressee	Influencing behaviour	Wait here till it stops raining
Phatic	Contact	Establishing or maintaining social relationships	Nasty weather again, isn't it?
Metalingual	Code	Referring to the nature of the interaction (e.g. genre)	This is the weather forecast
Poetic	Message	Foregrounding textual features	It droppeth as the gentle rain from heaven

Table 3.1: Jakobson's six functions of languages (adopted from Chandler, 2002).

contrast to the external context (including the context of others)—in which they create meaning for themselves. Sebeok relates this to the functional circles in the Umwelt of Von Uexküll, and states that the biological use of Umwelt is not applicable to the explanation of human signs. Besides the Umwelt—the external context—there is an internal context:

Sebeok was the first effectively to point out... [the difference]... between language, which is a matter of an Innenwelt or modeling system that is not wholly tied to biological constitution, and communication, which is a universal phenomenon that in and of itself has nothing whatever to do with language. (Deely, 2001, p. 132)

Eco (1976) also addresses the importance of the internal and external world by creating a distinction between *codes or signification (system)* and *sign production or communication*.

There is a signification system (and therefore a code) when there is the socially conventionalized possibility of generating sign-functions, whether the functives of such functions are discrete units called signs or vast portions of discourse, provided that the correlation has been previously posited by a social convention. There is on the contrary a communication process when the possibilities provided by a signification system are exploited in order to physically produce expressions for many practical purposes. (Eco, 1976, p. 4)

This internal and external world is displayed in figure 3.3, a communication model that is a combination of the communication model of Sebeok and the framework of Goldkuhl. The combined model focuses on the communication process, but shows that we do not want to neglect the existence of an internal world of context and its signification system, i.e. it complements the model of Goldkuhl that focuses on the communication process.

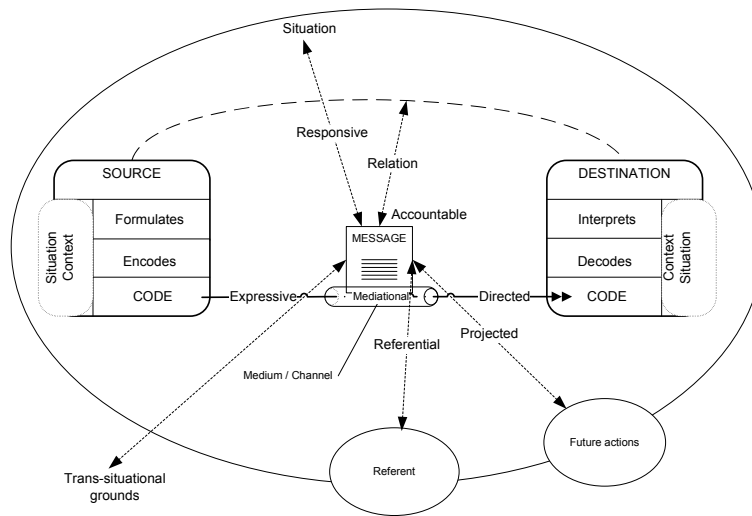


Figure 3.3: Communication model (adapted from Sebeok, 1991; Goldkuhl, 2005).

Goldkuhl's model describes a communication situation (external world) between two actors, the addresser (source) and the addressee (destination). The relation between the message and the addresser is called *expressive* and is *directed* to the addressee. The message functions as a mediator thereby creating a relation between both actors and is referential in that sense that the message *stands for* something. Messages are related to other messages and depend on a social situation, the time and place, i.e. such a relation to prior messages and other circumstantial factors is called situationally responsive. Messages often are directed to future actions or excite a response in someone else, e.g. when a person says to someone else: "It is cold in this room!", then the response can be the closure of a window. This function is called projected and can often explicitly be put as reference in a message, e.g. "It is cold here; could you close the window?". Goldkuhl also refers to trans-situational social grounds, which can be of a general character such as social institutions and norms. The model of Goldkuhl mainly focuses on the communicative acts and not on the underlying signification system or theory of codes. The message is the locus of attention and not the actor and the conventions or social constructs to which an actor itself socially commits, i.e. the model should consider that "*every act of communication to or between human beings—or any other intelligent biological or mechanical apparatus—presupposes a signification system as its necessary condition*" (Eco, 1976, p. 9). Hence, the model of Goldkuhl lacks a signification system but it highlights the importance of communication functions and is concerned with what

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the message should contain¹², see table 3.2.

Communication function	Explanation	Corresponding question
(1) Trans-situationally compliant	The message is in accordance with general institutions and norms and specific trans-situational grounds, which may be brought into the situation as a social background for the communication.	Why? What reasons there?
(2) Situationally responsive	The message may be a response to prior messages in the communication situation and other situational features.	Why? What reasons here?
(3) Expressive	The message is an expression of the addresser's subjectivity (intentions, desires, skills, emotions, values, understandings, commitments etc).	By whom?
(4) Referential	The message says something about something in the world; objects and processes talked about.	About what?
(5) Accountable	The message needs to be comprehensible, which means that it must to some degree be self-contained and include sufficient self-references and arguments to explain its role in the communication process.	What is meant?
(6) Directed	The message is directed towards one or more addressees. There may also be secondary recipients (an audience).	To whom?
(7) Relational	The message establishes certain action relations (expectations, commitments, states) between addresser and addressee, and sometimes socially broader.	What is done?
(8) Projected	The message may be an initiative for further actions.	For what?
(9) Mediational	The message is expressed in some medium (channel, carrier) and thus utilising the particular features of this medium.	How? By what means?

Table 3.2: Explanations of communicative functions (Goldkuhl, 2005).

The analysis of messages and its communicative functions can support MAS developers in designing a message-based communication model for actors in a Multi-Agent System that interact with the help of these messages. In the field of

¹²The framework of Goldkuhl can be used to analyse (types of) messages. To be concrete, consider a police-officer who writes a ticket to a commuter who violated a traffic-rule. The analysis of the message is that: (1) the message has its trans-situational background in the system of law and norms of conduct in traffic, (2) the message is relating to the current situation of the driver who ignored the red light (3) the police-officer expresses the intention to influence the behaviour and future actions of the driver by ordering him not to ignore the red-light again, (4) the message refers to the law system, i.e. the obligation to follow traffic rules as a driver, (5) the message should be comprehensible, i.e. the ticket its meaning should be clear to the addresser in such a way that the addresser is responsible for its current and future actions, (6) the ticket should contain information (name, address, etc.) that it is directed to that specific driver, (7) the ticket addresses the relationship between the police-officer and the driver; it expresses the roles of the police(-officer) and the driver, (8) the message directs to change in behaviour and payment of the fine, and (9) the carrier is paper, and of course the (non)verbal communication between the police-officer and the driver.

MAS, many agent-application developers mainly analyse or model the expressive function that, according to Goldkuhl (2005), corresponds to the speech act theory (cf. Austin, 1962; Searle, 1969). The speech act theory is concerned with communication as action, i.e. speech actions are performed by agents just like other actions, in the furtherance of their intentions (Wooldridge, 2002). In speech act theory there is a differentiation in functions of speech: the *locutionary*, the *illocutionary* and the *perlocutionary* (Austin, 1962). They represent, respectively, the making of an utterance (what is talked about), what is done by the locutor in saying something, and what the effects are on the addressee. Searle (1979) divided the illocutionary function into a classification of five main types of speech acts that are commonly used in the field of Information Systems and MAS:

1. *Representative act* which commits the speaker to the truth of the expressed proposition (inform, asserting, concluding).
2. *Directive act*, which is an attempt by the speaker to get the addressee to do something (requesting, questioning).
3. *Commissive act*, which commits the speaker to some future course of action (promising, threatening, offering).
4. *Expressive act*, which expresses a psychological state (thanking, apologising, welcoming, congratulating).
5. *Declarative act*, which effects immediate changes in the institutional state of affairs (declaring war, christening, marrying, firing from employment).

Speech act theories, like the ones of Austin and Searle have had an impact on the development of actor communication languages in Artificial Intelligence and Multi-Agent Systems.

Actor Communication Language¹³

In order for actors to be social, exchange knowledge and have meaningful, constructive and intelligent interaction, the actors should not only have knowledge of a common language, but also a common understanding of the terms used in a given context. Thus, as mentioned before, the actors require a social convention or common language and a signification system (common understanding).

For communication and shared understanding to be effective, the actor requires a couple of components that are necessary for exchanging knowledge. Figure 3.4 shows the possible components of an actor: the representation components, the communication components and components that are not directly related to shared understanding (Finin, Fritzon, McKay, & McEntire, 1994). According to Finin et al. (1994), the communication can be divided into knowledge of an (1) interaction protocol, a (2) communication language and a (3) transport protocol.

¹³We could have discussed this section in chapter 2, but addressing it in this section allows for a more convenient comparison with semiotics

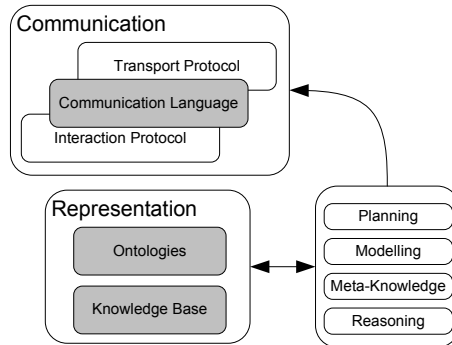


Figure 3.4: Components of the actor (adopted from Finin et al., 1994, p. 3).

The interaction protocol refers to high level strategies that governs interaction with other actors and are context sensitive, e.g. a negotiation scheme or a social construct that guides the communication: “If that actor asks me something I first require permission of my boss”. The interaction protocol is a social construct; a construct on which we will elaborate more in section 3.4.2. The communication language (e.g. KQML, explained later) however, does not involve the social situation, but is more related to attitudes regarding the content of the exchange communicated, i.e. if it is a request, assertion or any other form of query (Finin et al., 1994). The transport protocol is the physical network protocol (TCP, HTTP, FTP), which we leave out of the discussion in this dissertation. Similar to this distinction is the semiotic ladder of Stamper (1973) that states that communication is built up from the physical world towards the social world, see table 3.3.

Stamper's semiotic ladder		Finin et al.
<i>Social world:</i> norms, contracts, law, culture...	Human Information Functions	Interaction Protocol
<i>Pragmatics:</i> Intentions, communication, conversations...		
<i>Semantics:</i> meanings, signification, validity...	System Platform	Communication Language
<i>Syntactics:</i> formal structure, logic, data...		
<i>Empirics:</i> variety, channel capacity, codes...		
<i>Physical world:</i> signal, traces, hardware...		Transport Protocol

Table 3.3: Similarity between two approaches of communication (adapted from Stamper, 1973).

The [physical world] and empirics are concerned with the physical aspects of signs and their statistical properties when different

media are involved. Together with syntactics, they constitute the infrastructure to support the other three layers: semantics, pragmatics and social world. The three lower layers will answer questions referring to how signs are organised and expressed, as well as the physical properties they have, while the upper layers [semiotic layers] are concerned with the use of signs, how they function in communicating meanings and intentions, and the social consequences of using signs. (Baranauskas, Liu, & Chong, 2003, p. 69)

As Baranauskas et al. (2003) acknowledge, there is still a lot of discussion about the distinctions made between social world vs. pragmatics and pragmatics vs. semantics. In the discussion of this dissertation, we therefore will stick to the distinction of Finin et al. (1994) that will suffice in the development and use of Agent Communication Languages as implemented in our MAS in chapter 5.

In order to communicate, actors have to share knowledge and the concept of communication should be used in the sense of *sharing*, i.e. a process of signification shared by a community or according to Cherry (1980, p. 30) “communication is an act of sharing”. For actors, to share information they are assumed to have representations¹⁴, such as a knowledge base. A set of rules regarding syntax and semantics that can give structure to the elements in the knowledge base is often referred to as an ontology. According to Wooldridge (2002, p. 180):

An ontology is a formal definition of a body of knowledge. The most typical type of ontology used in building [actors] involves a structural component. Essentially a taxonomy of class and subclass relations coupled with definitions of the relationships between these things. (Hendler, 2001)

The knowledge base and ontology can be expressed in a content language, such as KIF (Knowledge Interchange Format) or XML (eXtensible Markup Language), in which the declaration of properties of a domain and the relationships between things in the domain can be expressed. Whereas KIF and XML are concerned with the content, KQML (Knowledge Query Markup Language) is an ‘outer’ language (the envelope) that encompasses the content language. The KQML language can be thought of as consisting of three layers: the content layer, the communication layer, and the message layer (Finin et al., 1994).

The content layer bears the actual content of the message, in the [actors’] own representation language... The communication level encodes a set of message features which describe the lower level communication parameters, such as the identity of the sender and recipient, and a unique identifier associated with the communication. It is the message layer that is used to encode a message that one application would like to transmit to another. A primary function of the message layer is to identify the protocol to be used to deliver the message and to supply a speech act or performative [e.g.

¹⁴And of course cognition, e.g. cognitive mechanisms that can handle representations.

one of the five types defined by Searle,] the sender attaches to the content... In addition, since the content may be opaque to an actor, this layer also includes optional features which describe the content language, the ontology it assumes, and some type of description of the content (Finin et al., 1994, pp. 10–11).

We take an example of a KQML dialogue, see table 3.4, to illustrate its working in interaction between actors.

<i>KQML Dialogue</i>	
Message X (evaluate	:sender A :receiver B :language KIF :ontology motors :reply-with q1 :content (val (torque m1))
)	
Message Y (reply	:sender B :receiver A :language KIF :ontology motors :in-reply-to q1 :content (= (torque m1) (scalar 12 kgf))
)	

Table 3.4: KQML dialogue (Wooldridge, 2002, p. 173).

Actor A sends a message (Message X¹⁵) to actor B with a query (q1) that requests the value of the torque on m1. In the message, the KQML performative is *evaluate*, the content is (*val (torque m1)*), the ontology used in the content is *motors* and the language is *KIF*. Actor B sends a response (reply) that the *torque m1* is *12kgf*—a scalar value (Wooldridge, 2002).

KQML is an Agent Communication Language (ACL), based on speech acts theory. FIPA¹⁶ (FIPA, 2002) is a common standard Agent Communication Language, superficially similar to KQML, and an example of an agreement—a signification system—between agent-application developers about how agents in a MAS should communicate with each other, i.e. they should have the same textual coding system (e.g. FIPA) in order for agent-applications to ‘understand’ each other.

However, in MAS, social interaction is often only implemented based on the communication process in the form of speech acts (such as KQML) and tries to describe the social level of actors with help of this communication process. In our opinion, semiotics gives social interaction a better theoretical ground in the form of a signification system that resides mainly in the minds of actors. In the next section, we want to discuss the social actor, social constructs and the semiotic level that describes the use of conventions, norms and signs in communication and interaction with other actors.

¹⁵The three levels of KQML can be discerned in Message X; the *content* keyword is the content level, the values of the *sender*, *receiver* and the *reply-with* are part of the communication level and *reply*, *evaluate*, *language* and *ontology* form the message layer.

¹⁶The Foundation for Intelligent Physical Agents

3.4 Semiotic level, social constructs and the social actor

Artificial Intelligence (AI) has made progress in trying to understand its connection with the physical world and lately more specifically with the social and cultural world. AI started with the classical cognitive approach that describes an actor based on symbol systems and states that this is a sufficient and necessary condition for intelligence (Newell & Simon, 1976; Newell, 1980). However, the approach focuses on the internal organisation of the actor (the cognitive system) and not (so much) on the influence of the outside world on the functioning of the cognitive system. Later on, in the nineties, *embodied cognition* or *situated cognition* gained a lot of popularity and defines that the actor's bodily experiences are acquired through its interaction with its environment, which is also referred to as *physical situatedness*, or 'New AI' (Suchman, 1987; Brooks, 1991b; Clark, 1999). 'New AI' argues that symbol representations are not always necessary to implement intelligent behaviour.

Both approaches have delivered some wonderful applications we could never have dreamt of, but have a disadvantage: the problem of paying no attention to the social and cultural setting in which these applications function. The disadvantages of the classical approach is that the symbol is loosely connected to the outside world and therefore the symbol in the symbol system doesn't acquire its meaning from reality, referred to as the *symbol grounding problem* (Harnad, 1990). The problem with *New AI* is that it is able to implement many (lower) cognitive functions, e.g. obstacle avoidance, attraction by light, but that the higher cognitive functions such as language processing and self-reflection are not possible without any representation (Vogt, 2002).

3.4.1 The situated actor and the semiotic level

Human beings can be considered to have some degree of *physical situatedness*, but it has been argued that humans are also *socially* (and *culturally*) *situated* (Lindblom & Ziemke, 2003). Dautenhahn et al. (2002) suggest to broaden the concept of (physical) situatedness; it not only includes the physical environment but the social or cultural environment as well. Lindblom and Ziemke (2003) state that the Russian scholar Lev Vygotsky (1962, 1978) (together with Mead, one of the first social constructivists) already pointed out the importance of social interactions for the development of individual intelligence during the 1920-1930s. Vygotsky argued that individual intelligence emerges as a result of the biological factors in combination with interaction with a social environment through a developmental process.

Hence, there is a need to connect the social, cultural and physical world with the 'Innenwelt' of the actor. We suggest a separate level of description, the semiotic level that comprises both, the Umwelt and the Innenwelt of the actor and creates a social actor that is both embodied and situated, i.e. the semiotic level

is a level of signs or constructs that connects the cognitive or individual level¹⁷ with the social level.

As stated in chapter 1, the semiotic level describes the use of language and signs in communication and interaction in order to agree on social constructs (e.g. common plans, or contracts) (Gazendam, 2004; Helmhout et al., 2004; Helmhout, Gazendam, & Jorna, 2005a). We adopt theories of semiotics and more specifically organisational semiotics in order to bridge the gap between the social level and the individual level. The social constructs at the semiotic level—explained in the next section—can be represented as signs for supporting social interaction between actors, and also as representations at the individual or cognitive level in the form of symbols or chunks in a physical symbol system (Newell, 1980).

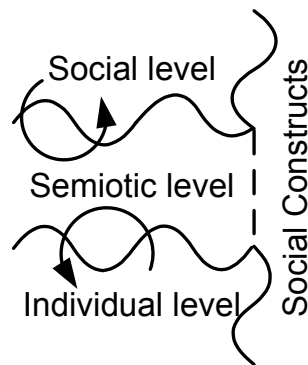


Figure 3.5: Social constructs present at three levels.

Figure 3.5 shows that the representation of social constructs is present at the different levels of description. At the social level, social constructs are stored in organisations or institutions as (social) artefacts, at the semiotic level, social constructs are represented as signs and at the individual level, social constructs are represented in the form of chunks that are stored in a physical symbol system. As mentioned before, semiotics is present at all three levels. Therefore, we have drawn the curved boundaries between the levels. The semiotic level its function is to mediate between those levels (with help of its signification system and sign production) and allows the sharing of social constructs between the social and individual level.

The discussion about the cognitive agent and the physical symbol system will be elaborated in the next chapter. In the remaining part of this chapter we want to focus on the semiotic level and social constructs, and why they are required for an actor to behave socially.

¹⁷Actually there are five levels; the individual level can be divided into three levels: the intentional, functional and physical level (cf. Dennett, 1978, 1987), but we want to keep them out of the discussion in this section.

3.4.2 Social constructs

As mentioned before, social constructivism states that a social construct can be seen as an invention or artefact constructed by interaction between members of a social group or interaction between groups. The aim of social constructs, as proposed in this chapter, is to bridge the gap between the social level and the individual level of the actor and finds its origin in organisational semiotics—the Stamper school—that suggests the combination of *affordances* and *signs* to bridge this gap (Stamper, 1973, 2001).

Affordances stress the interaction between a human agent and its environment based on behaviour patterns that have evolved over time in a community. Signs stress the social construction of knowledge expressed in sign structures... Stamper sees affordances as repertoires of behaviours and distinguishes physical affordances and social affordances. (Gazendam & Liu, 2005, pp. 7–8)

A (physical) *affordance* is a set of properties of the environment that makes possible or inhibits activity (Gibson, 1979). After many encounters with the environment, this can result in a *habit of action*, which is a commitment to act with a connected action program that governs the actual acting (Peirce, 1931; Gazendam, 2001, p. 40). From a semiotic point of view, one could say that a physical affordance becomes a *social affordance*¹⁸ as well, the moment the physical affordance is shared between actors in a community (e.g. a traffic light). The experience of the object (shared with others) is built up in the mind of the actor; the actor is socially situated through interaction and perception (e.g. of the traffic light), which is a process of social construction of signs in the actor's mind. The resulting signs are organised as units of knowledge consisting of a *semi-indexical*¹⁹ representation of an affordance and its associated habit of action.

Social constructs are social affordances (Liu, 2000; Stamper, 1973, 2001) and can be seen as representations of cooperation and coordination, based on intertwined habits and mutual commitments that are often expressed in sign structures such as agreements, contracts and plans. A social construct (Gazendam, 2003; Liu, 2000) is a relatively persistent socially shared unit of knowledge, reinforced in its existence, by its frequent use. In organisations, social constructs take the form of, for instance shared stories, shared institutions (behaviour rule systems), shared designs, shared plans, and shared artefacts. These social constructs support habits of action aimed at cooperation and coordinated behaviour.

More or less following Dignum (1996)'s stratification of social norms, social constructs can as well be differentiated in types or levels of social constructs:

¹⁸The social affordance has a strong social basis and could be defined as 'a pattern of behaviour that is shared in a social community', to be distinguished from Gibson's affordance concept that is connected with perception and is defined as 'characteristics of the world' that afford a certain pattern of behaviour (Gazendam & Liu, 2005).

¹⁹"A semi-indexical... [representation]... results from a process where raw data resulting from the interaction between actor and environment are unconsciously filtered, transformed, and matched to patterns (Marr, 1982; Jorna, 1990, p. 57)." (Gazendam, 2003, p. 2)

the first type is the multilateral institutional or behavioural system in which actors commit to social constructs of a community, organisation, country or society. These constructs are formalised and mostly written down in documents and are part of a large population; they are 'institutionalised' in order to coordinate behaviour between people. Many of these constructs formed at this level are constructs that prescribe patterns of behaviour in other social constructs (its descendants) and are general indications; they state in general what is allowed and what not. An example of a multilateral social construct is the freedom of speech: the question if scolding and thereby harassing people can still be considered as falling under the law of freedom of speech is debatable and whether strict written rules can cover this problem. Therefore social norms play such an important part in society by establishing tacit codes or patterns of behaviour, thereby filling the gap that cannot be covered by rules.

The second type is the plan or model to which individual actors or groups are committed to. They regulate appropriate or coordinated behaviour for smaller groups. For instance, planning and teamwork models (Decker, 1995; Jennings, 1992) are social constructs that consist of joint intentions in which actors reach agreements about how tasks should be allocated and planned, according to the schedule they have committed to.

The third type is the bilateral construct established between two actors, e.g. a marriage contract or a producer-customer relationship in which there is an agreement about the rules of behaviour during the life-span of the relationship.

These three types of social constructs can be captured into an abstract or generic theoretical framework of social constructs that has properties applicable to all these different types of social constructs.

In this dissertation, we apply the social construct²⁰ as a social construction established by interaction of actors at the social level. In the discussion about the semiotic level, we have stated that social constructs are not only part of an organisation, but also (according to methodological individualism) are represented as (shared) knowledge in the mind of actors. In order to use the social construct (as a knowledge chunk) in an actor model, there is a need to distinguish and formalise properties of the social construct.

We have defined the following theoretical framework of (a not limited set of) properties of a social construct:

Attached norms or rules: social constructs can contain (a collection of) norms or rules that guide action and prescribe appropriate behaviour in a certain context. *Norms*²¹ can be defined as rules of conduct that constrain (self-interested) behaviour and that are adopted and enforced in a (in) formal setting (Mahoney & Sanchirico, 2001). Our daily encounters with social norms (and law) are evident, for instance, when we are driving with our car at the right side of the street, or being polite for letting the elderly sit in the bus, etc.

²⁰“According to the Stamper school of organisational semiotics (Stamper, 1973) there are main social constructs called *social affordances*, to which norms are attached”. (Gazendam, 2006, p. 158)

²¹There is a large bulk of definitions and literature on norms, a complex field in sociology, law and economics which is not treated here in detail. (see Gibbs, 1965; Etzioni, 2000; Morris, 1956; Sunstein, 1996; McAdams, 1997)

3.4. Semiotic level, social constructs and the social actor

Written/unwritten (coded/sensory): a social construct can be formed and communicated by writing the attached rules and norms down on paper, or they are internalised in actors and with the help of interaction transferred (language or gestures) to others (March et al., 2000).

If we refer again to the traffic law, then this is an example of a written social construct that clarifies (1) an evaluation of what actions or behaviours are (not) permitted and (2) the type of reactions to the (incorrect) behaviour, such as sanctioning or rewards.

In the case of the bus and an old woman²², the social construct and its norms are not registered with an authoritative organ, instead, behaviour is controlled and reinforced by collective expectation and evaluation of others and assumptions about possible reactions that eventually can result in shame and guilt.

Life span: every social construct has a starting time, an evolution, a monitoring and controlling period and a finishing time (Liu, 2000, p. 67). The life span of every social construct, be it a norm, an emotion or an organisation varies and depends on other properties connected to the social construct, e.g.

- One of the referred *objects* or *facts* changes in such a way that it falls under another categorisation or role, e.g. when a person dies, it falls under the category of dead people and cannot fulfil its expectations anymore, or an organisation has gone bankrupt, in which case all connected social constructs (and norms) are not linked to the organisation anymore, or when a child grows up to become an adult, it becomes financially responsible for its own behaviour, and so on.
- Lack of *reinforcement* of the social construct will let the social construct disappear, e.g. if a social construct is not communicated to others and violations not corrected, then the construct will never become a habit and will never become part of society.
- Changes in *enforcement costs*: a social construct is often kept in place because people enforce others to obey the norms attached to the social construct. McAdams (1997) gives an example of an anti-abortion movement that informally monitors clinics and sanctions those women that enter the clinic. “[...] a new drug... allows women to obtain abortions with visits to their regular doctor rather than a clinic, which in turn, raises substantially the cost of detecting an abortion” (pp. 394–395). Detection of abortion and the enforcement of anti-abortion becomes too expensive and gradually more women will go to a doctor to get an abortion and the anti-abortion movement probably will lose ground.

Roles and identification: the actor is given a role or identification, e.g. employer, employee, to make clear the authority, control and rules applied

²²There is sometimes even a distinction in norms and gender, i.e. letting an old woman sit and not the old man, because the old man is assumed to be stronger than the woman.

to that role (Liu, 2000). Roles are often associated with norms, i.e. "... roles are... a product of social norms" (Sunstein, 1996, p. 928). These roles can be common roles like 'the citizen'—how does a good citizen behave—or to a specific function like a general of an army. Panzarasa, Jennings, and Norman (2001) state that adopting a role imposes responsibilities, influences and constraints upon the role-player: a) a set of expectations about the other role-players' mental attitudes and behaviour and b) a set of expectations of how the other role-players will respond to the role-player its own mental attitudes and behaviour. The difference between roles is often regulated by the following property: authority, responsibility and control.

Authority, responsibility and control: according to Fayol (1918), authority can be seen as 'the right to give orders' and the expectation that they are followed. Control and power can assure that actors behave responsible; they can be part of a directly involved authoritarian party or an independent third party. Assigning authority to someone creates a responsibility for that person to give orders and control whether other actors take their responsibility in following the 'rules of the game'. Responsibility also means that someone with authority has a duty to report about his/her behaviour to the community or authority that has given him/her the authority; Fayol remarks that authority is sought after, but that responsibility is shunned.

Stamper (2001) argues that authority is necessary to start or finish a social construct. For instance, a police-officer who has the right to regulate traffic, has the authority to finish (temporarily) the social construct of obeying to the signals of the traffic-lights and instead starts of a social construct in which the signals of the police-officer replace the previous social construct of traffic lights²³.

Inheritance or prerequisite of other social constructs: a social construct can be part of a complex network of connections with other constructs (that are often the result of earlier agreements). For example, when preparing a sales contract, sales men refer to their conditions that are registered at the institution of commerce and the registered conditions inherit conditions from public law (Liu, 2000, p. 68).

Scenario: according to the language action school (Barjis, Dietz, & Liu, 2001), there can be a more or less standardised process (scenario) for establishing a social construct between actors. Scenarios are often put on paper in which a specific order of social constructs over time is written down. In communities, scenarios are expressed in rituals and transferred from generation to generation.

The scenario is similar to the concept of script of Schank and Abelson (1977), which they define as: "A script is a structure that describes appropriate sequences of events in a particular context. A script is made up of slots and requirements about what can fill those slots. The structure is

²³Such a scenario is actually authorised by another law (authorised by the justice department) that says that signals of a police-officer overrule all other signs of traffic law.

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an interconnected whole, and what is in one slot affects what can be in another [p. 41]" (as cited by Jorna, 1989). A well known example of a script or scenario is the 'restaurant script' of Schank and Abelson that describes the typical scenario of ordering food in a restaurant.

Another example of a scenario (or script) is a marriage in the Netherlands. It has to be prepared by well defined pre-conditions such as pre-marriage in which case the couple has to be registered for at least two weeks and a maximum of a year. The actual marriage is often a combined marriage, one of a religious character and one of a governmental character. Besides the registration issues, the scenario takes preparations from both sides in the form of norms concerning clothes, the dowry, the witnesses, and so on.

Context: context as property is a debatable issue, however there are two interpretations of context. Context can be situated *outside* the actor, and—possible at the same time—situated *inside* the actor, i.e. context is represented as symbols in the 'real' world stored externally from the mind and also as symbols stored in the mind of the actor.

The external context contains certain (impelling) elements—so-called affordances (Gibson, 1979)—perceived by the actor to which it is sensitive or is triggered by. In contrast to Gibson, and similar to Stamper (Stamper, 1973; Stamper, Liu, Hafkamp, & Ades, 2000), Vera and Simon (1993, p. 41) state that affordances "are carefully and simply encoded internal representations of complex configurations of external objects, the encodings capturing the functional significance of the objects".

We assume that there has to be sufficient coherence between an internally represented social construct and an element in the external environment in order to activate or trigger the social construct. According to Gazendam, Jorna, and Helmhout (2006):

The recognition of a situation in which a [social construct] must become active must not only depend on the recognition of physical affordances like other actors, objects and situations, but also of an ongoing monitoring in the actor's mind of the state of the social context in terms of invisible entities like positions of rights and obligations of himself and of other actors, agreements and appointments that must be held, and so on. (p. 2)

To demonstrate what impact context can have, compare the police-officer signalling directions for traffic and the same police-officer taking part in a play in a theatre signalling the same directions for dancers. The only difference in both cases is that the context is different. In the case of the theatre, the dancers, spectators, spotlight, and so on, create a different atmosphere in which the police-officer cannot function as a 'real' police-officer anymore. The environment (dancers, spectators etc.) and its associated expectations do not create the same affordances for the police-officer.

Social constructs with all their properties are internalised and established by a process of socialisation and communication, and during their life-span are

monitored by enacting actors, through observation, mentoring, practise, and training (March et al., 2000). Secondly, they create standards of appropriate behaviour and stabilisation, i.e. they create shared expectations of behaviour and when exercised, they are evaluated by others as well. Thirdly, when they are widely known and accepted as legitimate, they are often self-enforcing, and its associated psychological cost of rejection will rise, e.g. the individual or group involved can feel psychological discomfort whether or not others detect the rejection (McAdams, 1997). And fourthly, because social constructs are connected to roles and authority, they can create formal and informal social structures.

Such a social structure exists out of a network or collection of social constructs. When a social structure is legitimate, legally acknowledged and officially registered, it is often referred to as an organisation or institution. The form and life-span of a social construct depends on change of context, entering and exiting actors, change of roles and authority and many more possible modifications of properties. Some constructs have shown a long experience of successes and are written down on paper, thereby encoding parts of history; they accumulate experiences generation after generation.

In chapter 6, this theoretical framework will be applied for analysing two demonstrative experiments. Both experiments are concerned with traffic laws and coordination between two actors. The first experiment demonstrates the emergence of social constructs as a result of adaptation and learning. The second experiment is concerned with actors that have prior knowledge about social constructs and the transfer of social constructs between actors. In the second experiment, the actors are more organised in the sense that one of the actors is assigned the role of police-officer and the other the role of citizen.

3.4.3 Social constructs and organisation

An organisation is a collection of actors that share a collection of social constructs and every actor is taking part in one or more situations that are regulated by these shared social constructs. However, each actor has individual properties, and experiences different interactions, perceptions and cognitions during its life inside and outside the organisation. Hence, the actor possesses personal (also biological) characteristics, e.g. attitudes, norms and values. Personal characteristics and experiences (the so-called personal social construct) have influence on the creation of different representations of social constructs in the heads of the actors, thereby creating different representations of the organisation as a whole in the mind of every actor, i.e. the participation (now and in the past) of the actor in several communities accounts for an unique personal collection of social constructs. Based on individual experiences and interaction with other actors, every actor can build up a *unique* history of social constructs that are successful or unsuccessful and can act on its environment based on that experience.

Figure 3.6 shows that two actors, X and Y in a context or organisation, share knowledge in the form of internalised social constructs (representations in the mind) and externalised social constructs (e.g. physical artefacts and documents such as contracts, rules or laws). The actor has a personal (social) construct that is partly in coherence with the social constructs of the environment, i.e. he com-

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mits himself to the social constructs that overlap with what the actor thinks he has in common with the social constructs in its environment. In the case of social constructs that do not overlap with his personal (social) constructs, there can be for example a mechanism that excites some (emotional) resistance in following those, i.e. the actor follows the social construct, but his personal preferences are in favour of not doing so; he is forced by the social pressure of others to follow them. Secondly, there is dynamics of social constructs triggered by language action, change of signs, context or interpretation differences. The interaction of signs is a process of semiosis in which actors express their meaning with help of a sign production and an underlying signification system.

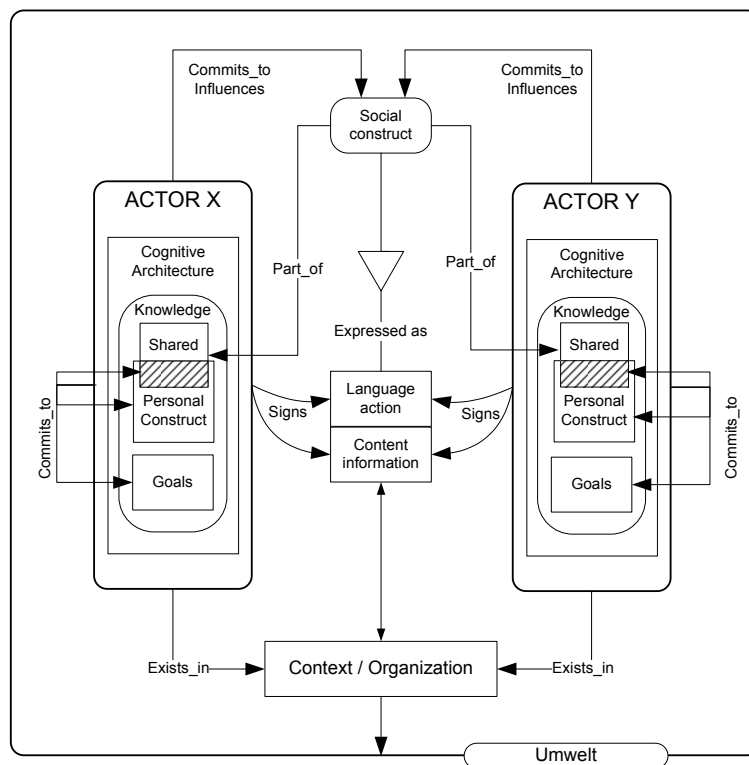


Figure 3.6: Social constructs, actors and context (adapted from Helmhout et al., 2004).

We argue that social constructs are formed by interaction of actors and the process is based on individual learning and personal (social) construction by each actor involved, i.e. there is an establishment of the social construct in agreement with others and at the same time this social construct is internalised in the mind of the actor. Argyris and Schön (1978, pp. 16–17) similarly argue that individuals jointly create public maps, but at the same time have private images of that map:

An organization is like an organism each of whose cells contains

a particular, partial, changing image of itself in relation to the whole. And like such an organism, the organization's practice stems from those very images. Organization is [a social construct] of individual ways of representing organization. Individual members are continually engaged in attempting to know the organization, and to know themselves in the context of the organization. At the same time, their continuing efforts to know and to test their knowledge represent the object of their inquiry. Organizing is reflexive [or reflective] inquiry. . . [Members] require external references. There must be public representations [, i.e. social constructs] of organizational theory-in-use to which individuals can refer. . .]These are the shared descriptions of the organization which individuals jointly construct and use to guide their own inquiry. . . Organizational theory-in-use, continually constructed through individual inquiry, is encoded in private images[—personal constructs—] and in public maps[—social constructs] . . .

The existence of public maps or shared social constructs are only possible when actors recognise and acknowledge them. Some social constructs are informally established and present in a tacit form while other social constructs are often arranged by authoritative rituals and processes of internalisation and after mutual acceptance, social constructs are maintained and reinforced by authoritative signs (e.g. a law or an authoritative leader gesturing the recorded signs).

In the first case, we rather speak of an *informal* organisation in which social constructs are based on habits of (inter) action, whereas in the latter we speak of a *formal* organisation that maintains a public system of rules, also known as an *institution* that has been assigned social power and authority by civilians that are part of a society. An institution is a *behavioural rule system* (Gazendam, 2003) containing rules, laws and constructs that states how to act in certain circumstances or according to Rawls (1971):

Now by institution I shall understand a public system of rules which defines offices and positions with their rights and duties, powers and immunities, and the like. These rules specify certain forms of action as permissible, others as forbidden; and they provide for certain penalties and defenses, and so on, when violations occur. As examples of institutions, or more generally social practices, we may think of games and rituals, trials and parliaments, markets and systems of property. An institution may be thought of in two ways: first as an abstract object, that is, as a possible form of conduct expressed by a system of rules; and second, as the realization in the thought and conduct of certain persons at a certain time and place of the actions specified by these rules. (p. 47)

In this section, we have described the properties of the social construct and that an organisation can be seen as a collection of social constructs, i.e. we elaborated more or less about the social structure of organisation and society. However, the processes that create changes in social structure, i.e. the process of cre-

ation, evolution, control and ending of social constructs need to be addressed as well.

3.4.4 Social constructs: creation, evolution, control and ending

The processes of creation, evolution, control and ending are social processes; they are only possible when there is mutual agreement of other (involved) actors (e.g. one cannot change the law by itself without allowance of others). The life span—(in)formally from the moment social constructs are created to the moment they are declared invalid or are neglected—depends on the use of them in social interactions with others, i.e. social constructs are shared and agreed upon between actors. Secondly, in case of the individual, the life span of the social construct depends on the actor's own habits of promoting and using the social construct. The actor's physical limitation of remembering them and/or communicating the construct (in)directly to others influences the life span of social constructs. The assumption is that internalised social constructs are part of the memory of the actor, so their existence is subject to the way they evolve (forgetting and reinforcement) in memory and the (triggered) awareness of the actor about them inside its own memory.

Thus, we argue that social constructs are social in the sense that they are part of a society and its history, and that actors have subscribed or agreed upon the establishment of those social constructs. On the other hand, we ascribe the social construct to the individual level as part of memory, i.e. the actor has internalised the social construct; the cognitive system of the actor determines whether a social construct is active, suppressed or no longer active/forgotten.

In this section we want to illustrate how social constructs and its attached norms do start, evolve, are controlled and end. To make clear that almost any object (a social construct) in nature that is discovered by people have norms attached to it, we consider property and ownership rights (cf. Gazendam, 2006). A well known access right to property is the option on access or ownership of property in the future, i.e. the moment something is discovered people issue options for ownership.

We will illustrate the creation, evolution, control and ending of a social construct with help of an example that explains the sale of options on acres on the moon which is just one of many examples in which people declare their claims on properties. The following citation from "lunar-registry" gives an example in which it claims to be the legal organisation for registering property²⁴.

...your property record[, a claim on property of the moon,] is permanently and publicly registered by the International Lunar Lands Registry in its annual publication, which is copyrighted and deposited in the United States Library of Congress and with international patent and trademark offices, including the United Kingdom (UK Patent Office), Japan (Japan Copyright Office), Russia (Rospatent) and with the United Nations (UN Depository Library), in compliance with the Berne Convention

²⁴Retrieved 26-03-2006 from <http://www.lunarregistry.com/info/deed.shtml>

The idea of claiming “shares” on the moon originally dates from the moment the United Nations “... set forth a plan to protect the Moon and all outer space from exploitation by nations that would seek to claim extraterrestrial bodies in their own name...”²⁵, i.e. the “Treaty On Principles Governing The Activities Of States In The Exploration And Use Of Outer Space, Including The Moon And Other Celestial Bodies”. The twentieth July 1999, the “Lunar Republic” wrote a proclamation of property on the moon and started selling registration certificates on the Internet. From that moment the social construct, i.e. a share of the moon, is started.

Now, we will first analyse the creation of the social construct—the “lunar certificate”—and its properties attached that ‘legally’ identifies it as a sign of ownership of the moon. Before the process of changing ownership between the ‘legal’ organisation that distributes lunar shares and the individuals that buy the shares, the organisation has to announce its legitimacy with help of significant symbols in society.

First, when the company—lunar registry—starts up its business, it registers itself with well respected institutions, e.g. the United States Library of Congress, the UK Patent Office, and so on, in order to announce that it inherits rules and norms of these institutions and behaves accordingly to these norms. Second, it claims to be part of a large organisation, the Lunar Republic Society that sells lunar articles and publishes a lunar journal. Third, it claims that is the *only legal* institution for selling shares of the moon, it signals this by a sign that states “officially authorised, Lunar Republic Society”. And finally the organisation is trying to convince people that the money of the project goes to the “Kennedy II Exploration Project (K2LX)”, a project of scientists, students and post-graduates.

The organisation has inherited social constructs and attached norms of other institutions, it attempts to put itself in the context of and associates itself with these institutions. The social construct “lunar-certificate” is a written document that claims to inherit those properties as well, i.e. being a product of a legitimate organisation. The organisation does not give any information regarding the life-span of the certificate, e.g. what happens when I die, probably the lunar-certificate its expiration is based on the assumption of the life-expectancy of the company self. The purchase of the certificate and the transaction are social constructions as well. The transaction and its rules are according the rules of credit-card companies and the additional rules applied by the organisation itself. Again, in case of transaction by Internet, the lunar-organisation attempts to signal its trust by a trading sign; they register itself and inherit properties of the company ‘Squaretrade’ that in its part identifies itself with the organisation ‘etradе.org’; an independent non-profit organisation enabling trust based on privacy for personal information on the Internet.

A relatively simple social construct such as a lunar-certificate needs and creates many properties associated with a social construct. This example shows how complicated a social construct can be. During the life-span of the lunar-certificate the following processes are distinguished:

²⁵Retrieved 27-03-2006 from <http://www.lunarregistry.com/info/legal.shtml>

3.4. Semiotic level, social constructs and the social actor

1. *Creation*²⁶

The creation of the lunar-certificate is a process of advertising its existence by Internet and at the same time referring to legal institutions to create legitimacy for its existence.

2. *Evolution*

During its existence, the lunar-certificate evolves, e.g. when other organisations such as moonshop.com are competing for existence, 'lunar-registry' has to change its identification in order to show that it is superior to its competitors.

3. *Control*

Control of the 'official' registration seems to be impossible, however the organisation claims it is possible because it registers the certificates with legal institutions. In the case of the transaction, again there is no guarantee of being trustworthy, no matter what the 'Squaretrade' sign tries to signal, there is only the assumption that there is a control of trustworthiness.

4. *Ending*

The ending of the life-span of the lunar-certificate is also not evident. The lunar-certificate is a relationship between the registrar and the owner of the certificate. The moment the registrar or the owner ceases to exist or dies, the relationship ends and the lunar-certificate does not 'legally' exist anymore.

The life span itself has three phases, the creation, the evolution and the ending of a social construct. The control function is a separate process that can be applied during the entire life-span, i.e. during creation, evolution and ending of the social construct. The process of *creating* a social construct can occur in three ways (Flynn & Chatman, 2003):

1. Based on adaptive emerging social behaviour; when two actors have a conflicting or mutual goal/interest. For instance people going out of the elevator while others only can go in when it is empty, or a group meeting in which people after a couple of times play their (habitual) role.
(*tacit agreement in a community*)
2. The other is communicative action or an authoritative ritual in which with help of communication, e.g. speech acts, a social construct is formed; it starts with the actor that wants to propose, inform, or is requested to inform or propose a social construct to another actor.
(*agreement in a community*)
3. The third formation process is external norm formation and a clear specification of roles, in which certain individuals are authorised, e.g. police officers, to prescribe and enforce norms, thereby regulating the individuals they supervise (Von Hayek, 1979).
(*creation on authority*)

²⁶There are only two valid ways of creating a social construct: (1) agreement upon it in a community; (2) creation by an appropriate authority (e.g. the United Nations).

While the last two are part of an explicit process in which the actors communicate or bargain openly about what they want, the emergent (informal) social construct creation is an implicit process in which assumptions are made of other actors' behaviours.

After forming the social construct and its attached norms, a process of *evolution* takes place. During evolution, the actor and community learns if the norm is still beneficial to him or his community and if other norms are involved as well. During evolution of norms a complete network of norms can be formed. López y López, Luck, and d'Iveron (2005) mention that norms are not isolated from each other, but are often interlocked—in our approach a social construct—and in which one norm is triggering another norm, e.g. the expectation of an invitation triggers the norm of bringing a gift. The network of norms becomes an informal institution as a system of habits, rituals, norms and scenarios (similar to the scripts of Schank and Abelson (1977) as mentioned before).

The *ending* of a social construct can happen during the process of evolving, when an actor wants to re-negotiate, releases and renews the social construct before the agreed time-span is reached; the contents or time-span are changed, e.g. the announcement of the European Commission of a draft directive on driving licences²⁷ states that the national driving licenses will be replaced in order to improve "the free movement of citizens by ensuring mutual recognition of licenses by the Member States". Secondly, when the agreed time-span of a social construct ends, the involved actors mutually release the social construct. However, this does not mean that the actors are forgetting the success or failure or format of a social construct; the actor can bring it in as prior knowledge to new negotiation processes. Thirdly, the ending can happen when the social construct is not reinforced over time and forgotten; the social construct can still exist, written on paper, but actually the influence of the construct already ended and is not reinforced anymore, or the context changed and the social construct is not adapted to the new situation. Fourthly, the actor suppresses the social construct when the economic or psychological cost of following the social construct is too high.

The processes of creation, evolution and ending depends on the support for the norm (Axelrod, 1986), such as the dynamics of the environment (e.g. entering and exiting actors), regime change and the control process that monitors these processes.

Control and monitoring are processes²⁸ that determine the actual creation, evolution and ending of a social construct. During creation, actors are involved in controlling the creation of a social construct, e.g. in case of a lunar-registrar, an institution has to control and acknowledge the legitimacy of the start-up. During the evolution process, the social construct and attached norms are due to change, because attached norms may evolve or are violated, e.g. actors can start to re-negotiate about other terms of the social construct in order to modify the social construct.

Therefore, the process of control is vital for determining if the other actor(s)

²⁷Retr. 27-03-2006: http://ue.eu.int/ueDocs/cms_Data/docs/pressData/en/misc/89035.pdf

²⁸These processes determine other processes, therefore they are often referred to as meta-processes, e.g. meta-norms or in our case meta-social constructs.

are still aware of the conditions and associated norms of a social construct. Conte and Castelfranchi (1995b) state that in a group of addressees to which a norm applies, the norm should be respected by all its addressees; it is a necessary consequence of the *normative equity principle* defining that agents want their 'normative costs' to be no higher than those of other agents subject to the same norms. Actors stick to a norm as long as the advantages of following up a norm outweigh the advantages of not following the norm, i.e. the actor has to comply with the norm and if necessary defend the norm or give up the norm (when the costs of obedience are too high compared to punishment). However, rewards (positive approach) can also be a drive to support norms, e.g. the no-claim discount of insurance companies rewards and enforces people to be more careful about damaging their insured property.

A closely related, non-monetary characteristic that keeps a norm system alive is *reciprocity*. "Reciprocity of norms means that a norm works because there will be a beneficial effect for everyone if everyone behaves according to that norm. A norm tells you how you ought to behave, and you trust that other actors will behave in that way as well" (Gazendam, 2003, p. 17). However, even reciprocity requires some monitoring effort.

The evolution process is always subject to control mechanisms of punishments and rewards, thereby reinforcing norms that lead to certain expected and desired behaviours. In other words, a social construct as part of a community is always subjected to meta-processes that either reinforce, punish or abandon the use of a certain social construct. The social construct itself can become a meta-process for the maintenance of other social constructs when it is a prerequisite for those other constructs. In bureaucratic organisations or institutions, these dependencies can grow to immense proportions; so immense that for instance a minister of justice of a country cannot comprehend it anymore and requires consultants to advise him or her in speaking justice. Hence, the roles and relations in a bureaucratic system form a complex network of dependencies between social constructs in the form of power and authority relations.

We are aware that many systems of social constructs are based on trust, power and relationships between actors. However, in this dissertation we first require a simplified social actor model that is able to (socially) construct simple (coordination) mechanisms first. The implementation and studying of more complex social constructs such as found in bureaucratic organisations is beyond the scope of this dissertation.

In the following section, we close the chapter and discuss the meaning(s) of the social construct and the requirements necessary for the actor to become a social actor. These requirements give guidelines for the modelling—see chapter 5—of a social actor with help of social constructs that enables the actor to be socially situated in its environment and share social constructs with others.

3.5 Discussion

In this chapter we have analysed and determined that social constructs are necessary for an actor to 'behave socially', i.e. social interaction requires certain aspects of actors that enables them to behave socially, cooperate and coordinate

their (joint) activities. With the concept of social construct, we give an answer to the question that we have raised in chapter 1: “What is required for an actor to exhibit (stable) social behaviour?”.

We approached the problem first from a philosophical perspective on social constructivism by arguing that actors socially construct the world and experience the organisation as a social construct, i.e. the social construct is an entity that exists because of its mutual acknowledgement by actors that participate in a community. Secondly, we argue that a social construct can be traced back to representations in the mind of the actors in the community (methodological individualism) and as a coordination mechanism structures the interaction among people. Hence, the actor lives in an environment—Umwelt or information field²⁹—in which the actor is physically and socially situated and able to create, process, use and transfer signs; a semiotic process or semiosis that enables the actor to construct worlds or representations in their mind (Innenwelt). Thirdly, we argued that semiosis requires a communication process necessary to socially interact with others and that such a communication process presupposes a signification system, a system that enables to interpret/decode and produce/code signs. The last argument we want to make is that such a signification system has to be supported by *cognition* possible in the form of a physical symbol system that manipulates those signs. We argue that such a system is necessary for an actor to be social, i.e. for an actor to be social it has to construct the social world with help of representation of social constructs, thereby creating social representations (or needs) of other actors and the community in which the actor lives.

As mentioned before, the concept of social construct is the contribution of this chapter. We argue that the social construct is a requisite for the cognitive actor—explained in the next chapter—to act socially and coordinate actions with other actors. Throughout the chapter, the social construct is applied at different levels of abstraction. The following figure gives an overview of the meaning of the social construct in a society.

We summarise the four meanings of social construct as follows. First of all, a social construct is the result of interaction between actors. At the social level, actors habituate their action and thereby create a habitat of social constructs. Sign production delivers codes or signs (the semiotic level) to which actors assign (shared) meaning. This shared meaning or knowledge becomes normative at the moment it influences behaviour of the members in the community, e.g. norms that guide behaviour such as the respect for older people. In order to change and understand meaning, actors require a signification system (Eco, 1976). Such a signification system needs to be grounded in the actor, which can be done with help of a plausible cognitive architecture at the cognitive level (functional level), e.g. ACT-R (Anderson & Lebiere, 1998) or RBot, respectively chapter 4 and chapter 5; a cognitive architecture enables the actor to process and

²⁹Stamper (1992) proposed a new paradigm [...]: *the information field*...[People]... are all governed by the forces in the information fields and therefore behave accordingly. These forces are related to their interests, assigned functions, tasks, objectives, personal values and organisational goals. These forces may be present in the forms of formal and informal rules, beliefs, cultural habits and conventions, which can be called *norms*. (Liu, 2000, p. 8)

The Four Meanings of “Social Construct” (SC)

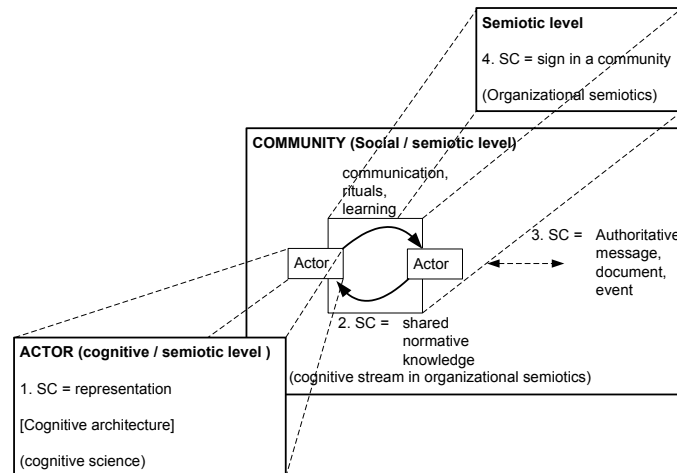


Figure 3.7: Four meanings of a social construct.

produce signs.

The social construct or a derivative of the social construct (sign) needs to be present at the cognitive, social and semiotic level. In the community, the social construct is present as a sign(-structure) (4). These signs or social constructs are exchanged by actors in the community with help of communication and rituals. The exchange is made possible by a medium that allows the transport of social constructs (3) as messages, documents or events³⁰. Communication between actors and the reinforcement caused by the frequent use of social constructs will lead to stable habituated patterns of behaviour (e.g. rituals) and shared normative knowledge (2). Besides that, the individual actor needs a physical symbol system (Newell, 1980) that enables it to hold *representations*, process and produce signs/symbols/social constructs (1) and exhibit intelligent action.

Thus, social constructs are representations that are stored in a cognitive architecture—a signification system that interprets and operates on representations (symbols in the mind)—and/or are stored in the environment as for instance artefacts or documents (symbols in the world). The social construct is reproduced or transferred and maintained by social interaction between actors. Because of its internal and external representation, the social construct functions as a glue that connects the actor having a cognitive architecture, via its signification system and communication process with society and culture.

The concluding assumption for an actor in order to exhibit social behaviour is that a social actor requires at least the capability (1) of acting socially in groups

³⁰Social construct theory as it has been explained here has been developed within multi-actor theory and the cognitive stream of organisational semiotics and gives, by a theory for the community at the semiotic/social level, a cognitive and semiotic basis to the more general concepts and mechanisms described by sociology and social psychology for the community at the social level.

Chapter 3. The Social Actor

(organisations), (2) of communicating social constructs to other actors, (3) of storing social constructs, e.g. habits, norms, rules and so on, in the form of representations, (4) of storing knowledge of the world in representations, and (5) a cognitive architecture that supports the maintenance of representations in memory and operates on these representations.

In this chapter we mentioned the cognitive architecture but we did not thoroughly discuss the cognitive architecture. The cognitive architecture has its roots in the field of cognitive science, e.g. philosophy of mind, cognitive psychology and computational theories of cognition. In this research, the cognitive architecture is in the centre of attention. Therefore, the next chapter is devoted to the discussion about cognitive science and a selection of a cognitive architecture.