

Emotion, Information, and Cognition, and Some Possible Consequences for Library and Information Science

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We present our semeiotic-inspired concept of information as 1 of 3 important elements in meaning creation, the 2 other concepts being emotion and cognition. We have the inner world (emotion); we have the outer world (information); and cognition mediates between the two. We analyze the 3 elements in relation to communication and discuss the semeiotics-inspired communication model, the Dynacom; then, we discuss our semeiotic perspective on the meaning-creation process and communication with regard to a few, but central, elements in library and information science, namely, the systems-oriented perspective, the user-oriented perspective, and a domain-oriented perspective.

Thought is not necessarily connected with a brain. It appears in the work of bees, of crystals, and throughout the purely physical world; and one can no more deny that it is really there, than that the colors, the shapes, etc., of objects are really there. Consistently adhere to that unwarrantable denial, and you will be driven to some form of idealistic nominalism akin to Fichte's. Not only is thought in the organic world, but it develops there. But as there cannot be a General without Instances embodying it, so there cannot be thought without Signs. (Charles S. Peirce *Prolegomena to an Apology for Pragmaticism*. CP 4.551, 1906¹)

¹When citing from the *Collected papers of Charles S. Peirce* (1931–1958, Hartshorne & Weiss [vols 1–6]; Burks [vols. 7–8]), we follow the international standard, which is CP followed by volume and paragraph number. The eight volumes of collected papers were for a long time the basic source for Peirce studies and are still widely used by scholars. The collected papers include important writings, but many texts have been confusingly cut up and rearranged by the editors, following a thematic rather than a chronological method.

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Introduction

The topics of information and knowledge lie at the root of library and information science (LIS), both historically and analytically. In particular, the academic community of LIS, concerned with the organization and retrieval of information, has spent years discussing and clarifying the concepts of information and knowledge and the possible relationship between them (Taylor, 1968; Belkin, Oddy, & Brooks, 1982; Buckland, 1991; Brier, 1996, 2004; Hjørland, 1997, 2004, 2007, 2009; Capurro & Hjørland, 2003; Cornelius, 2004). Variations emerge in the definitions because of the background of the authors and the specific aims that they pursue; we seem to be facing a labyrinth on theoretical, methodological, and terminological grounds. Generally, the concept of information is approached through three general families of concepts: a systems-oriented view, a user-oriented view, and a domain-oriented view (see Ingwersen & Järvelin, 2005, for an excellent review regarding the systems-oriented and user-oriented views and Hjørland, 2004, regarding the domain-oriented view). Thus, we may approach information as objective entities handled by information systems, as objective entities that relate to work tasks, or as objective entities related to domains. The notion of information as something independently observable is shared among LIS scholars; but how information may be related to the complex processes of interpretation, meaning making, and information need (in short “knowledge”), is another matter. At the risk of contributing further to the expansion of the labyrinth, we will present a Peircean account of the concepts of information and knowledge, which we believe can be useful within the field of LIS. We believe that information science, in particular the fields concerned with organization and retrieval of information, struggle with a fragmented view of the information processes connected to the areas of the information system itself, the human agents

interacting with the system, and the community that frames the information behavior of individual users. We furthermore believe that the processes of knowledge organization and information retrieval are synonymous with a complex meaning-creation process in which emotional, informational, and cognitional signs blend together. Or, formulated differently, information relates to an emotional level of cognition and to deliberate, articulate knowledge structures. We will try to demonstrate that the concepts of emotion, information, and knowledge can be understood within the semeiotic and phenomenological framework of the American polymath C. S. Peirce (1839–1914). Inspired by Peirce, we see three elements make up the meaning-creation process: emotion, information, and cognition (in accordance with Peirce, we use *cognition* synonymously with *knowledge*; CP 6.605). To elaborate on this claim, we define here what we believe to be the emotional sign, the informational sign, and the cognitional sign seen from a Peircean perspective. We show how they interact and how they depend on each other. We discuss how emotion enters into information and how emotion and information enter into cognition. However, different kinds of emotions, information, and knowledge affect us differently, so we will also look at the concepts of emotion, information, and knowledge within the context of communication and address the general conditions for communication and the interpretational effect caused by any sign.

The overall focus and purpose of this article may therefore be condensed and formulated as follows. We demonstrate that, within a phenosemeiotic framework, the concept of information is intricate, that it is related to emotion and cognition, and that should be analyzed in terms of sign systems within a process of communication. Furthermore, we demonstrate that the concept of information is relative to the perspective of inquiry, this being a systems view, a user-oriented view, and a social view. We demonstrate how information relates to emotion and knowledge and vice versa, and finally, we demonstrate how this semeiotically based analysis is relevant for information science, especially the relation among the the systems-oriented perspective, the user-oriented perspective, and a domain-oriented perspective. Our present work follows the line of thought already set by Brier (1996, 2004, 2006, 2008) and Thellefsen, Brier, and Thellefsen (2003); however, the important contribution is the phenosemiotical understanding of information.

The article is structured in the following way: First, we outline emotion, information, and knowledge as understood within Peirce's framework of a scientific phenomenology, this phenomenology being a fundamental conceptual condition. Second, we look at the Peircean semeiotic and give an account of the concept of emotion in terms of the sign trichotomy qualisign, sinsign, and legisign. Third, we propose a semeiotically-inspired definition of information in terms of the sign trichotomy of icon, index, and symbol and at the same time we touch upon Peirce's understanding of cognition as knowledge involving the sign trichotomy

consisting of rheme, dicent sign, and argument. Fourth, we place the emotional, informational, and cognitional sign inside our model of communication (called the Dynacom), which is a semeiotically-inspired communication model. Fifth, we look at the communication effect caused by the utterer upon an interpreter; we call this effect the *significance effect*. Sixth, we put forth a few conceivable consequences of our phenosemeiotic thoughts and concepts of emotion, information, and knowledge for the field of LIS, by approaching the information system, the information need, and the social context determining the information need. Hopefully, our efforts will point toward a more unified perspective that can accommodate different aspects of information, the cognition of the users, and the structuring power of a social environment.

Emotion, Information and Knowledge

To understand the nature of the important concepts of emotion, information, and knowledge; how they are related; and what role they play in the meaning-creation process, we define them in accordance with Peirce's three categories of consciousness found within his science of phenomenology: Feeling or Primisense, Altersense, and Medisense, because Peirce believed that human consciousness exemplifies all three categories. As he wrote in a draft to the book *A guess at the riddle* (c. 1890):

There are no other forms of consciousness except . . . Feeling, Altersense, and Medisense. They form a sort of system. Feeling is the momentarily present contents of consciousness. . . . Altersense is the consciousness of a directly present other. . . . Medisense is the . . . medium between Primisense and Altersense leading from the former to the latter. It is the consciousness of a process bringing to mind. (CP 7.551)

However, before we begin defining the emotional, informational, and cognitional sign, we must clarify that we do not deal with Peircean metaphysics here. We define the cognitional sign or, plainly, the knowledge sign without, for example, discussing the relation between truth and reality, and we do not take into account Peirce's concept concerning the fallibility of knowledge. We do not address Peirce's famous papers on cognition from the *Journal of Speculative Philosophy* (1868–1869; CP 5.213–63; 5.264–317; 5.318–57), nor do we focus on Peirce's objective idealism or his philosophy of mind–brain–body–world interaction, in which there is mind within nature and nature within mind (cf. CP 6.25; 1.316). Our interest is the structural relationship among emotion, information, and knowledge. However, placing emotion as Firstness, the first of Peirce's three categories (see definition in the following text) in a meaning-creation process does entail some metaphysics, namely, that “. . . an emotion of the mind is real, in the sense that it exists in the mind whether we are distinctly conscious of it or not. But it is not external because although it does not

depend on what we think about it, it does depend upon our state of our thought about something.” (CP 7.339).

Information is real too and being placed in Secondness (see definition in the following text); information is facts. Consequently, information is both real and external. Let us give an example: A given book is full of information independent of what you and I may feel or think about it. It may just sit on the bookshelf not being read by anyone; still, it is full of information. Imagine a twig broken in two by the wind; even though no one hears the sound, the sound is still information. Information at this level in cognition does not entail interpretation. Now, this must imply that emotion is internal and information is external, and it is only cognition that can bridge the internal-external gap, and this inferential process is the meaning-creation process. Let us now look at the emotional, informational, and cognitive sign.

The Emotional Sign

The emotional sign (involving qualisign, sinsign, and legisign) is related to Primisense and Firstness: it involves characteristics of primisense; it is an experience of the monadic quality of an immediate feeling; it is a simple and noncompound quality; it is what it is in itself, by itself. It has no relation to the possibility of something else; it has no parts; it has no beginning, middle, or end. In “The list of categories: A second essay” (c. 1894), Peirce asked his reader to imagine the following example:

Imagine me to make and in a slumberous condition to have, a vague, unobjectified, still less unsubjectified, sense of redness, or of salt taste, or of an ache, or of a grief or joy, or of a prolonged musical note. That would be, as nearly as possible, a purely monadic state of feeling. (CP 1.303)

Consequently, the emotional sign is a state of feeling. As such, it has not been manifested. Placing the emotional sign in the first sign trichotomy also defines it as a sign qua sign.

Naming the first sign in the trichotomy an *emotional sign* seems to be in agreement with Savan; in the article “Peirce’s semiotic theory of emotion” (1981), he draws our attention to the following:

Emotions do enter into the systematic explanation of behaviour. Further, emotions can be justified, shown to be inappropriate, disproportionately strong or weak, and so on. It is clear, I think, that an emotion is a legisign. Like any legisign it exists through its instances or replicas. Each such replica is an iconic sinsign (p. 323)².

If we take a slightly more psychological approach we could, according to Peirce, relate the emotional sign to a

sensation.³ It holds the same characteristics as the definition of Firstness given earlier. Peirce gives the following illustrative example:

... meaning by sensation the initiation of a state of feeling;—for by feeling I mean nothing but sensation minus the attribution of it to any particular subject. In my use of words, when an ear-splitting, soul-bursting locomotive whistle starts, there is a sensation, which ceases when the screech has been going on for any considerable fraction of a minute; and at the instant it stops there is a second sensation. Between them there is a state of feeling (CP 1.332).

Let us imagine that we are listening to a piece of music composed by Bach. The sensation begins the moment the music begins and stops when the music stops; what is in between is feeling (conveyed by the qualisign); the particular and dominant kind of feeling (conveyed by the sinsign) being one of, for example, happiness, sadness, nostalgia, etc. (conveyed by the legisign), the whole process being subsumed by the emotional sign. This is the first part of any process of meaning creation. However, for an emotion to come into being requires information of some sort. Let us therefore look at the informational sign.

The Informational Sign

The informational sign is related to Secondness and altersense (consisting of icon, index, and symbol), which means that it involves characteristics of them. Secondness or altersense is the two-sided consciousness concerning force and resistance; it is the clash between ego and nonego; it is experience including the experience of resistance from the object world, where we get to know facts, and facts are information simply and solely. The fact that a door is hard and heavy occurs to us only when we put our shoulder against the door trying to force it open. Peirce noted in “Pragmatism, fragment 2” (c. 1910), how:

Standing on the outside of a door that is slightly ajar, you put your hand upon the knob to open and enter it. You experience an unseen, silent resistance. You put your shoulder against the door and, gathering your forces, put forth a tremendous effort. Effort supposes resistance. Where there is no effort there is no

³We are aware of the work concerning emotions and feelings performed by Kuhlthau (see, e.g., Kuhlthau, 1991) in relation to the information-seeking process (ISP). However, the concept of emotion that we try to put to use in our theory of the meaning-creation process follows the metaphysical conditions given by Peirce. Hence, this concept of emotion is understood within the realm of evolution; therefore, it is dynamic, like the meaning-creation process into which it enters. As Peirce writes: “... an emotion of the mind is real, in the sense that it exists in the mind whether we are distinctly conscious of it or not. But it is not external because although it does not depend on what we think about it, it does depend upon our state of our thought about something” (CP 7.339). We believe Kuhlthau’s ISP model follows an unclear common-sense discourse both in relation to the development of ISP itself, and in particular in relation to the interdependencies of the concepts “feelings,” “thoughts,” and “actions.”

²See Thellefsen, Sørensen, Danesi, and Andersen (2007); Thellefsen, Sørensen, and Andersen (2008); and Thellefsen (2010) for discussions about Peirce and the concept of emotion.

resistance, where there is no resistance there is no effort either in this world or any of the worlds of possibility. (CP 1.320)

Naming the second sign of the trichotomy the *informational sign* means that information in this semeiotically-inspired perspective can either be iconic, indexical, or symbolic. It can be similar to, it can point to, or it can refer to by habit or convention. It is important to note that information, when being defined as nonego and iconic, indexical, or symbolic, represents a relation between a representamen, which is a sign, and its dynamical object, which is reality. As such, there is no human interpretation taking place at this level. Information just is, and it is emotion that gives information its particular quality, its tinge, tone, or flavor, if you will.

We are constantly being bombarded with information. However, only a small fraction of that information carries any significance to us. Peirce used a splendid metaphor to illustrate this point. He imagines consciousness as a bottomless lake, the surface of which (understood as self-consciousness) is constantly bombarded with percepts (information):

Consciousness is like a bottomless lake in which ideas are suspended at different depths. Indeed, these ideas themselves constitute the very medium of consciousness itself. Percepts alone are uncovered by the medium. We must imagine that there is a continual fall of rain upon the lake; which images the constant inflow of percepts in experience. All ideas other than percepts are more or less deep, and we may conceive that there is a force of gravitation, so that the deeper ideas are, the more work will be required to bring them to the surface. (CP 7.553)

Peirce uses this metaphor to show how ideas are attracted to one another through association of contiguity and resemblance. If someone is exposed to certain information, this information is recognized only insofar as an idea or ideas in the consciousness are able to recognize the sign. Now, if someone is exposed to information, which he seems to know, but has difficulty in placing, he will use a lot of mental energy to place the information in relation to knowledge sunk deep into the bottomless lake of ideas far back in his memory.

The informational sign gives direction and form to the interpretation to follow (conveyed by the symbol), pointing

out (via the index) the particular qualities (icons) of information in time and space. This is the second step in any process of meaning creation.

The Cognitive Sign

The cognitive sign is related to Thirdness and medisense; it is made up from the rheme, dicent sign, and argument. Medisense is: “the main process . . . of thought” (CP 7.276). Medisense is what it is from, what it mediates between, what it brings into relation, which is primisense and altersense, or ego and nonego, even though medisense cannot be reduced to this. Medisense makes the relation between primisense and altersense stable, general, and thereby intelligible. Put in another way, medisense is an interpretation of the process in which primisense and altersense become related:

This third state of mind is entirely different from the other two. In the second there was only a sense of brute force; now there is a sense of government by a general rule. In reaction, only two things are involved; but in government there is a third thing, which is a means to an end (404 [1893] 4 = n.p. cited from Houser, 1983, p. 344)

Medisense makes the relation between the emotional sign and the informational sign intelligible. It is at this level that information is interpreted and becomes knowledge. Consequently, there is a structural difference between information and knowledge. Information is not interpreted; interpreted information is knowledge. In addition, knowledge cannot be reduced to information; information finds its way into explicitness through thoughts, via arguments incorporated in dicent signs and rhemes, the whole process being subsumed in the cognitive sign.

At this cognitive level, the cognitive sign makes the relation between emotion and information intelligible. This is the third step in any meaning-creation process. Consequently, cognition is the bringing together of the external world with the internal world.

In Table 1, we summarize the three kinds of signs. So far, we have tried to present the meaning-creation process from a semeiotic perspective (Figure 1). Such a perspective does not necessarily entail a subject (according to Peirce [1905], the universe is perfused with signs [cf. CP 5.448, n1].), nor

TABLE 1. The three kinds of signs.

The emotional sign	The informational sign	The cognitive sign
The emotional sign is made up from qualisign, sinsign, and legisign.	The informational sign is made up from icon, index, and symbol.	The cognitive sign is made up from rheme, dicent sign, and argument.
The emotional sign is real and internal.	The informational sign is real and external.	The cognitive sign is real and makes the relation between the internal world and external ditto intelligible.
The emotional sign is what it is in itself and by itself; it is a sign qua sign.	The informational sign is a relation between two, namely, a dynamic object and a representamen.	The cognitive sign is a relation between three elements representamen, object, and interpretant.

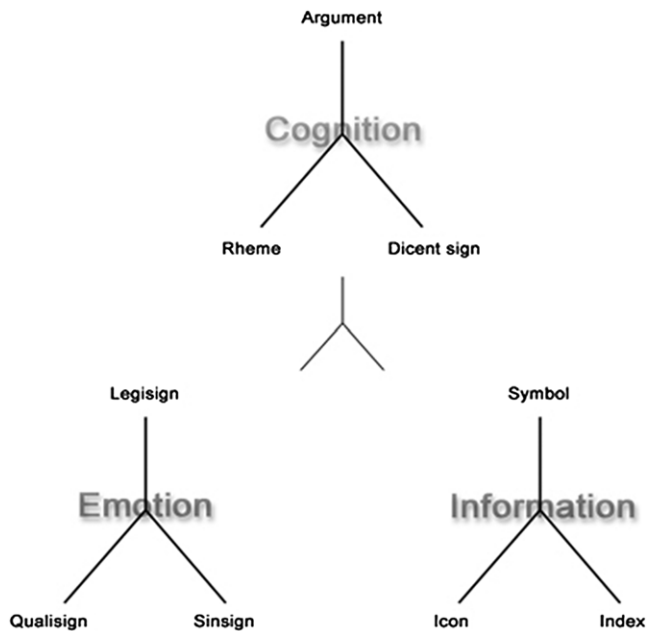


FIG. 1. The three elements of the meaning-creation process: emotion, information, and cognition. Cognition mediates between emotion and information as the internal world and the external world, respectively. Cognition makes the relation general and intelligible.

does it necessarily entail intentionality. However, communication between human agents involves intentionality; therefore, emotion, information, and cognition in the context of communication are at a level different from the meaning-creation process. Let us elaborate on the necessary conditions at this communicative level.

Emotion, Information, and Knowledge in a Communicative Perspective

If we place emotion, information, and knowledge in our Peircean inspired model of communication, the Dynacom, we can see that there are some conditions that have to be met in order to communicate emotion, information, and knowledge (Figure 2). We do not go into detail on the communication model here. However, we will mention the conditions that have to be met in order for any communication to succeed:

1. The sign's possibility to cause an effect of meaning, which can be emotional, informational, or cognitional.
2. The interpreter's ability to represent the sign as either a sign of emotion, information, or cognition.
3. Communication taking place inside a universe of discourse.
4. Utterer and interpreter possessing collateral experiences.
5. The cominterpretant occurring.

A key concept in the communication model is collateral experience. Collateral experience is prior knowledge necessary in order to interpret any sign or engage in any sign

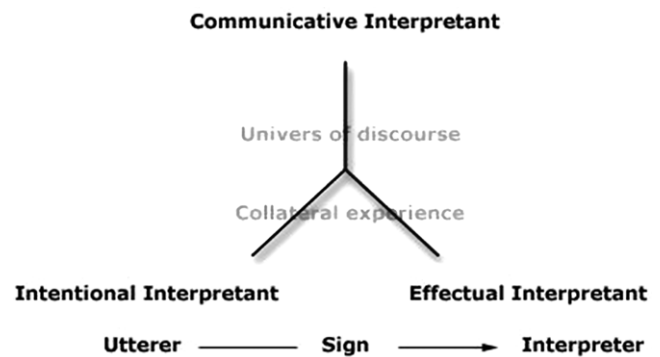


FIG. 2. Our semeiotically inspired communication model, the Dynacom (see Thellefsen, Sørensen, & Thellefsen, 2011, for a definition of the Dynacom).

activity. Collateral experience is an experience that is not mediated by the sign itself but is an experience parallel to the sign; an experience that precedes the sign. Collateral experience can be found at all levels in the communication process, and it is a necessary condition at all levels.

Collateral experience is closely related to a universe of discourse, but, where the universe of discourse determines the possible organization of objects, and thus modes of interpretation, collateral experience is the actual knowledge shared by the utterer and interpreter about concepts or phenomena in a communication process. It is important to stress that a universe of discourse is understood in broad and general terms, and as such addresses the contextual circumstances surrounding the communication process, which in some cases could be a scientific community, in other cases activities taking place in a more loosely defined and ad hoc context. In principle, a universe of discourse could be defined by the communication process itself taking place between the utterer and interpreter and thus be unique and temporary.

Let us elaborate on this using an example. We are standing and looking into the horizon, when suddenly we see a spot moving. We cannot see what the spot is, but we can see that it is something. We are wondering what the spot can be. The spot comes closer and we can see that it is a dog. Now we are talking about what the dog might do, if it is happy or bad-tempered; what kind of dog it is, etc. The dog comes closer and now we see that it is the neighbor's dog, Jake, and we know Jake to be a nice and playful dog.

There are two important elements in this example: (a) a process of meaning creation and (b) a process of communication. Let us take a closer look at both processes starting with the meaning-creation process. As a spot on the horizon, the dog is information (we do not yet know that it is a dog); it makes us attentive. Here the information already has caused emotions, but we need more information in order to know what the spot is; however, we are forming several hypotheses, and we know that it is something; even to recognize the spot as a spot calls for some kind of interpretation.

At this phase in the meaning-creation process, we can make many hypotheses about the spot in the horizon; it could be almost anything, so we cannot attach many characteristics to the spot. Consequently, the information level of the spot is broad in terms of possible things to which the spot can refer. Here, the emotional level is the dominant one. As the spot moves closer, it begins to manifest itself into something we can begin to recognize. We can now see that it is a dog, but not what kind of dog it is. In this phase of recognition, we have given up a series of hypotheses and identified so many characteristics that we can identify the information as a dog. Hence, hypotheses have been tested, as several characteristics have been added. The information level is the dominant one. With the dog coming closer, we can identify the dog as the neighbor's dog, Jake, a nice and friendly dog. At this level, the many possible hypotheses we had about the spot have been removed and several characteristics have been added. The information refers to the particular dog, so the cognitional level is now the dominant level; the information has been transformed into knowledge. The relation between Jake and our hypotheses (our interpretations of Jake) is true. The meaning-creation process is shown in Table 2.

As Table 2 suggests, the meaning-creation process runs through different stages. However, it is important to stress that it is always information that causes emotion and knowledge to arise. It is also important to stress that when the emotional level is dominant knowledge is also involved; we know that the spot is something, but we do not know what it is; of course, the lack of precise knowledge about the spot makes us uneasy. As we gradually attach more characteristics to the object, the knowledge level becomes dominant, but it still contains emotions; also, different kinds of emotions, for example, stress and anxiety (the dog might bite me) have been replaced with relief and other positive emotions. Consequently, the meaning-creation process is a continuous process consisting of adding characteristics to the signs and removing hypotheses from the signs based on prior experience with the given sign. Even though the universe of discourse and collateral experience are dialogical conditions, a train of thoughts as described above is a dialog between a self and the future self; therefore, we can apply the concepts of collateral experience and universe of

discourse to this situation. The universe of discourse is what an utterer and interpreter must share for communication to result (see Liszka, 1996). Liszka renames the universe of discourse to a discourse of community. "In order for genuine communication to take place the sign which is the utterer must be part of a sense common to the interpreter, and, conversely; it requires a sensibility gained from a common community" (Liszka, 1996, p. 92). It seems clear that the prior knowledge about the dog enables the interpreter to recognize the dog as a dog, and it is this prior knowledge that creates the universe of discourse, namely, that it is a spot moving, that it is a dog, and that it is Jake.

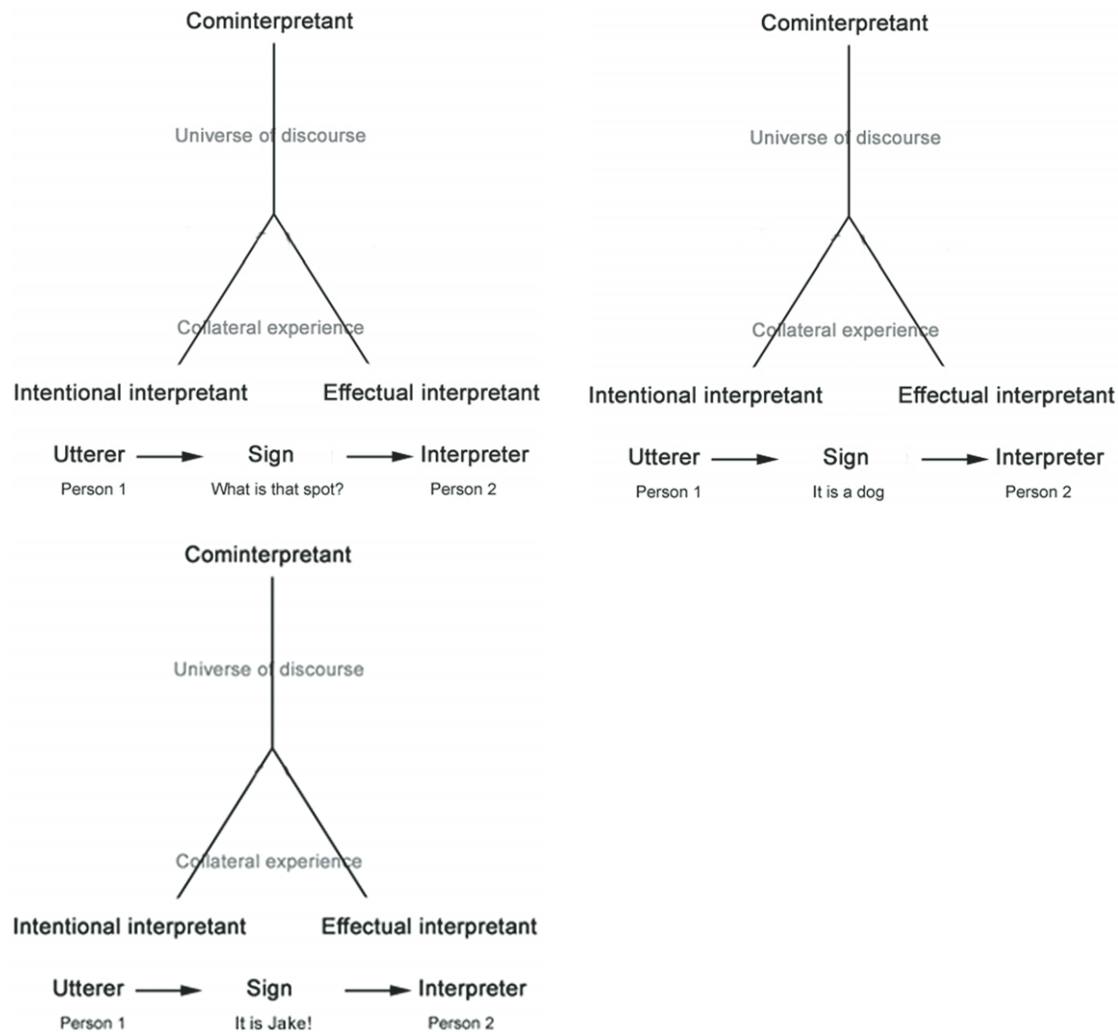
The second element in this example is the communicative element. Two persons are taking a walk in the countryside; they decide to cross a field when they see a spot moving on the horizon; the spot is moving toward them. Person 1 says to person 2: "Hey, can you see something is moving in the horizon?" Person 2 replies: "Yes, is it a dog or what is it?" Person 1 says, "I think it is a dog but I cannot see what kind it is!" Person 2 replies, "You're right, I think it is a dog too. I wonder if it might be aggressive?!" Pause. "Aah, it's Jake. Jake, come here boy. I've got a treat for you. Good doggie!" The communication process runs through the same phases as the meaning-creation process. We are discussing what the dog is; we apply collateral experience, because we can agree that the spot is something, but not what it is. In our discussion of the spot, we form several hypotheses of what the spot could be; these hypotheses involve and cause emotions because we do not know what the spot is; we are curious (Figure 3).

When the spot comes closer, we can see that it is a dog; it possesses the characteristics of a dog. At this level, we have enough information to interpret it as a dog—not a specific dog, but a dog. To do this, we must have collateral experience, we must both know what characteristics a dog has in order for it to be a dog. This is shown in Figure 4.

At this level, when we can see that it is a dog, but not a specific dog, the number of hypotheses is decreasing as the information is increasing. At this level, the amount of collateral experience is growing. Now, the dog is so close that we can see what dog it is. Based on our prior knowledge about the dog, we know that it does not bite; we know that it likes treats; we know that it is playful, etc. This is shown in Figure 5.

TABLE 2. Elements in the meaning-creation process.

Semeiotic	Levels of meaning creation	Breadth × depth	Significance effects
A spot in the horizon	Emotion (dominant) Information Knowledge	The number of characteristics is low, and the number of hypotheses is high	Emotional significance effect
An unspecified dog	Emotion Information (dominant) Knowledge	The number of characteristics is increasing as the number of hypotheses is decreasing	Informational significance effect
Spot, the neighbor's dog	Emotion Information Knowledge (dominant)	The number of characteristics is high and the number of hypotheses is low	Cognitional significance effect



FIGS. 3–5. At first, the emotional level is the dominant level. We do not know what the spot on the horizon is. We know it is something, so we have collateral experience about the spot. Our lack of information and knowledge about the spot enable us to put forth several hypotheses about what the spot is.

At this level, we know that the dog is Jake, the neighbor's dog. We have special knowledge about it, which we can obtain only by knowing this particular dog. This knowledge is primarily subjective.

This also points in the direction that the knowledge level entails some subjective element influencing interpretation; however, this is not to be confused with private knowledge. Knowledge is general and can be communicated; there is no such thing as private personal knowledge that only oneself can understand. As humans, we have the same cognitive apparatus, so our cognition follows the same pattern.

It may be worth mentioning that emotions can change during recognition. Starting with an unconscious feeling of uneasiness when looking at the spot in the horizon, the feeling may evolve into a state of joy when we explicitly come to think about Jake. Consequently, there is an intrinsic relation among the three elements in cognition and they make up a continuum. Information is able to cause emotions both at a subconscious level and at a conscious level. Both

levels require collateral experience in order to arise, but the cognitive level calls for explicit knowledge about Jake in order to interpret the intentions of the dog.

In this example, collateral experience exists between two individuals who can communicate about the object (the spot) perceived and share experience. Collateral experience in this example is thus an understanding or agreement about the object perceived. This also creates a discourse community between the two individuals wherein the discussion takes place.

The two examples illustrate that information may trigger perceptions that ultimately are measured in relation to collateral experience, and that the process of cognition follows similar paths whether we speak of individual perceptions or negotiated perceptions. In the first example, the perceiver is in dialogue with himself in order to understand the objects perceived. The second example adds the element of dialogue between two individuals. In this example, the object is perceived by separate minds that through dialogue may

share experiences about the object. Even though the object (the dog) is known by only one of the perceivers, this knowledge can be communicated to the other. The example with Jake the dog demonstrates how the knowledge creation process involves subjective as well as intersubjective knowledge. Let us now turn our attention to an example related specifically to LIS.

Let us replace Jake the dog with a number, 61.642. A person is looking at a shelf in a library where he sees the number 61.642. Let us imagine that the person has only vague knowledge about classification systems. The number being information may cause some emotions in the person, for example, curiosity. The person can identify the number as a number, he is in a library, and may recognize the number as some sort of library code. Consequently, the person has some collateral knowledge number in question. Then, he looks at the shelf with the number, all the books standing there seem to have psychology as a theme. This makes him conclude that 61.642 has something to do with psychology. This process the person undergoes is a meaning-creating process analogous to the example with Jake the dog. Now let us imagine a librarian looking at the same shelf with the number 61.642. He is so familiar with the classification system that the process of recognizing and interpreting happens almost simultaneously. Here, the librarian possesses so much collateral knowledge about the number that he instantly recognizes and interprets it. Consequently, as we saw with the example with Jake, the spot or the number cause emotions to arise, but, based on collateral knowledge, the information turns into knowledge. As a twist, we can say that, whereas we possessed subjective knowledge about Jake (we knew he was playful, etc.), the librarian possesses professional knowledge concerning the classification system, and it is the professional knowledge that comes into play, not only his subjective knowledge.

Let us use now return to the Dynacom as an analytical tool. A Bach scholar searches a database for a particular score by Johan Sebastian Bach. This score is important to him, in that he needs it to be able to prove a scientific point. He is used to searching the particular database, and is capable of identifying the relevant findings. He performs the search using the search phrase "J.S. Bach & suites for harpsichord." This results in, say, 100 relevant matches, of which 2 are highly relevant. Let us try to analyze this example by using the Dynacom.

The Bach scholar writes a query; this makes him the utterer. He endows the query with an intentional interpretant. The system receives the query and reacts to the query; this makes the system a quasi-interpreter. It is affected by the intention of the query and therefore represents an effectual interpretant. However, it is quasi, because the system is not able to react in ways other than the way in which it is programmed, but still it is an interpreter insofar as it translates the query into a given search result. The real interpreter is the Bach scholar; he uses the user interface as a medium in his dialog. Thus, the Bach scholar is both the utterer and the interpreter. This seems analogous to someone writing on

a piece of paper; this is also a dialog between the writer and his future self but in this case he has more control over what he writes; his thoughts are more identical to his writings on the paper. The difference between the writing into the computer and the writing on the paper is that the paper does not interpret that which is written in a way hidden to the writer, whereas the text written into the query field is definitely altered when processed by the computer, so the meaning becomes altered. This is also the case when communicating to another person or a group of persons. The utterance embedded with a certain intentionality may be completely misinterpreted by the interpreter. The more collateral experience between the utterer and the interpreter, the greater the chance for a correct interpretation.

In the case with the Bach scholar, it is a dialog between himself and his future self mediated by the algorithm in the database, but, when he sends the query, he loses control of it; he does not know how his query is being processed. However, this may occur to him when he gets the results of the search, which causes an effectual interpretant in the utterer. For the Bach scholar to have a successful experience, the database must find the document for which he searches; there has to be a query match. However, it is based only on the collateral experience the Bach scholar possesses about the match that he is able to determine whether or not the particular match is the right one. The more collateral knowledge the Bach scholar possesses about a given match, the more capable he is of determining the relevance of the match. This is shown in Figure 6. The discussion about relevance between query and match becomes very intricate, because the match for a given query can be judged only by the interpretation of an utterer/interpreter (relevance confirms the utterers hypothesis).

If we return to the communication model and say that the utterer is able to cause an effect in the interpreter, that being an emotional, informational, or cognitional effect based on

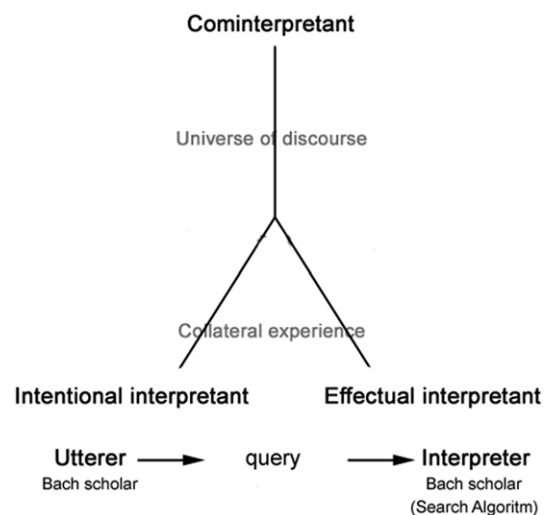


FIG. 6. A Bach scholar queries a search engine.

the collateral experience of the interpreter, then what can we say about this effect? We must say that different emotions, different kinds of information and knowledge effect us differently. The hypothesis is that the more collateral experience the interpreter possesses about a given sign (emotional, information, or cognitional signs), the more likely the interpreter is to recognize the sign as being of relevance to him. To understand this, we must address the significance effect, which is an interpretational effect caused by any sign.

The Significance Effect

There are three types of significance effects, which are related to the emotional sign, the informational sign, and the cognitional sign; we call them the *emotional significance effect*, the *informational significance effect*, and the *cognitional significance effect*, which tell us about the interpreter’s ability to recognize emotions, information, and knowledge, respectively, based on his experience and knowledge. These three types of significance effects are closely connected. In this way, the emotional significance effect and the informational significance effect can be abstracted from the cognitional significance effect; the emotional significance effect can be abstracted from the informational significance effect, but not the other way around. Analytically, this means that there has to be an emotional significance effect before the informational significance effect can occur, and there has to be an emotional significance effect and an informational significance effect before the cognitional significance effect can occur, and, if there is a cognitional significance effect, there also has to be informational and emotional significance effects. The significance effects follow the same logic as presented earlier.

One of the main points of the significance effect is that the recognitional level of the interpreter becomes reflected in the sign. It seems that signs are able to release and refer to a certain experienced memory in the interpreter. Within scientific knowledge domains, this experienced memory seems primarily to be logically and rationally based. Communicating the concept of “semeiosis” to an interpreter within the knowledge domain of sign theories will probably cause an interpretation concerning the technical aspect of a sign or maybe the historical roots of the concept, for example, that

the concept was very frequently used in “De Signis” (On Signs), a treatise on inductive logic written by the Epicurean philosopher Philodemus. In other cases, such as within the areas of marketing and commercials, signs may be used strategically to awaken certain emotional memories enabling us to relate to a given product, and the awakening of emotional memories might eventually persuade us to buy the given product. This latter kind of significance effect is at first based not on rational persuasion but rather on emotional experiences. If the sign does awake emotional or cognitional significance effects in the interpreter, it must be because the interpreter shares qualities or values with the sign to such a degree that the interpreter is able unconsciously to reflect himself in the sign, that is, agree on the premises and conclusion of the argument or be sympathetic about the values communicated by an utterer. Consequently, both the cognitional and the emotional significance effect are tied to the individual as a kind of quasi-empathetic experience. It is a quasi-empathetic experience inasmuch as the interpreter reflects himself in the sign because he is able to identify qualities in the sign that he himself contains or desires to contain. He sees himself through the “eyes” of the sign, so to speak. He learns from the sign, and the sign learns from him. As Peirce writes in the article “Some consequences of four incapacities” (1868):

But since man can think only by means of words or other external symbols, these might turn round and say: “You mean nothing which we have not taught you, and then only so far as you address some word as the interpretant of your thought. In fact, therefore, men and words reciprocally educate each other; each increase of a man’s information involves and is involved by a corresponding increase of a word’s information” (CP 5.313).

However, the effect is by no means solely individual. Being developed within the scope of Peircean semeiotics, the significance effects are rooted in the same scholastic realism. This means that any communication involves an utterer and an interpreter, and, for the communication to be successful to some degree, it must be general. If this is not the case, the utterer cannot communicate to an exterior world and not even to his future self; thus, no intelligible communication can take place. In Table 3, the emotional, the informational,

TABLE 3. Types of significance effects.

The emotional significance effect	The informational significance effect	The cognitional significance effect
The more experience one has with a particular emotion, the better one is able to interpret it. The interpretation takes place on a subconscious level. This opens up for the emotional sign’s ability to attract minds that share or desire the particular emotion. The stronger the desire, the stronger emotional significance effect.	Being on a communicative level, the informational significance effect designates the mind’s ability to recognize information. The more collateral knowledge the mind possesses about the information, the more capable the interpreter will be of recognizing it, or the greater difference the information makes to him, if we borrow terminology from Bateson.	The interpreter reflects his knowledge level in the concept; the cognitional significance effect depends on how much the interpreter “sees” his own knowledge level reflected. The more he “sees,” the stronger the normative effect, and vice versa.

TABLE 4. Precise communication is a condition for the release of a certain significance effect.

Semeiotic	Phenomenology	Breadth \times depth	Levels of meaning creation	P = predicates O = objects	Significance effects
Representamen	Ego (the inner world)	Qualisign \times Sinsign = (P) \times (O) =	Emotion (P and O)	P \uparrow O \downarrow O \uparrow P \downarrow	Emotional significance effect
Object	Nonego (the outer world)	Icon \times Index = (P) \times (O) =	Information (P and O)	P \uparrow O \downarrow O \uparrow P \downarrow	Informational significance effect
Interpretant	Ego and nonego (the mediated world)	Rheme \times Dicent Sign = (P) \times (O) =	Cognition (P and O)	P \uparrow O \downarrow O \uparrow P \downarrow	Cognitive significance effect

and the normative significance effects are placed alongside each other to make some similarities and dissimilarities clear. This is elaborated further in Table 4.

If we focus on the last two columns in Table 4, we can see that the more predicates a given sign has, the fewer objects it refers to and therefore the more precise the significance effect is, and the more objects a sign refers to, the fewer predicates it has. This means that, if an interpreter recognizes a given sign communicated to him in the way in which the communication was intended by the utterer, the fewer objects the sign will refer to, and the more predicates it possesses. So, we have a case where precise communication is a condition for the release of a certain significance effect, be that of emotional, informational, or cognitive character.

The Meaning-Creation Process

Three elements seem to make up the meaning-creation process: emotion, information, and cognition. So far we have tried to outline the relationship among these elements. They are understandable within Peirce's framework of consciousness consisting of primisense (emotion), altersense (information), and cognition (medisense), and semeiotics involving three-sign trichotomies. Consequently, the bringing of subconsciousness to self-consciousness is similar to the process of meaning creation or semeiosis, or we can say that the process of meaning creation begins with feeling and emotion and passes through experience of the world (the imagined or the physical world), and then enters into thought and concepts, the process being underscored by a degree of collateral experience.

We have tried to outline the element of collateral experience as a necessary condition for the transformation of information into knowledge. In any process of meaning creation, both at an individual and at a superindividual level, the recognition of collateral experience is essential and necessary to interpret information. Collateral experience is, however, not a situation of "either or," but rather a graded phenomenon. The more collateral experience one possesses about a sign, the more determinate the sign processes are, and the fewer objects the sign denotes. This means that the significance effect depends on collateral experience, whether the effect is emotional, informational, or cognitive.

Let us now, with the aforementioned statement in mind, look at a few perspectives for information science concerning the information system, the information need, and the social context determining the need for information.

Perspectives for Information Science

Information science, in particular the fields concerned with organization and retrieval of information, struggle with a fragmented view of the information processes connected to the areas of the information system itself, the human agents interacting with the system, and the community that frames information behavior of the individual users. We believe that the phenosemeiotic perspective presented earlier demonstrates how information relates both to an emotional level of cognition and to deliberate, articulate knowledge structures. The strength of the phenosemeiotic perspective is that it connects the three fundamental kinds of significance into a whole.

Thus, we argue in favor of a semeiotic view of information science that can accommodate the different aspects/levels of information, the cognition of users, and the structuring power of a social environment, and as such provide us with a stronger, unified, theoretical foundation for information science. We are fully aware that the three kinds of significance effects as suggested here rest upon a theoretical analysis and, as such, require further empirical investigation. Testing the nature of significance effects in an information system interaction environment is, however, outside the scope of this article. Nevertheless, the significance effects have by no means come out of thin air; we know, from studies in terminology and lexicography (Cabr , 2003; Felber, 1984; Myking, 2001; Sager, 1990; Thellefsen, 2004) that knowledge domain members are more familiar with the specialties of their knowledge domain, its concepts, and terminology than nonmembers of the domain. We also know that domain specialists are more attentive and cautious about their use of technical terms, simply because the meanings of technical terms are sanctioned by the community of the knowledge domain, and addressing a community of peers at, for example, a conference, necessitates a deliberate use of shared, specialized terminology. Many information specialists may consider this to be a common-sense fact, which may explain why research within LIS is so

far only piecemeal and has sporadically included research conducted within the fields of terminology and lexicography. Consequently, LIS suffers from a common-sense approach to LIS core concepts such as concept formation and concept delimitation (logic), categorization (similarity/dissimilarity, semantic relations), terminology (representation/signification), knowledge (cognition and distributed cognition), community (paradigms, universe of discourse), and communication (language/languageing and pragmatics), which, when addressed in terms of aboutness, information need, relevance, anomalous state of knowledge (ASK [Belkin et al., 1982]) hypothesis, information systems interaction/behavior, etc., neglect vital knowledge about the fundamental nature and implicit functions of information, knowledge, and social structures.

We consider it likely that signs develop through the stages of the emotional, informational, and cognitional significance effects. The emotional (significance) effect has been studied within, for example, marketing research, showing that framing signs, that is, placing products in suggestive environments, causes emotional effects in relation to consumer perception of products, successively affecting their behavior. This we consider to support the hypothesis of the emotional and informational significance effects, but also the cognitional significance effect, because, the greater the knowledge about the product, its function, its purpose, its quality, etc., the greater the effect.

The semeiotic line of thought, however, is not a bird's-eye and neutral perspective. It is, rather, as formulated in this particular context, a method for reasoning about the information processes connected to the information system and the conduct of human agents and the community. Consequently, the point of view from which we consider the functions and processes of information systems interaction is essential. The next sections touch upon the difference in approaching the processes of information interaction from the perspective of the information systems, from the perspective of the user, and from the perspective of the community.

Understanding the Information System

Information systems are generally systems of representation, whose purpose is to support information activity performed by users. Within the context of LIS, information systems are defined as knowledge-organization systems (KOS), whose purpose is to support information retrieval in bibliographic databases. Already here we encounter a terminological problem, in that no system, in our phenosemeiotic view, organizes knowledge, because no cognition is taking place; it can only be information that the system organizes. Hence it must be an information organization system (IOS). In the phenosemeiotic perspective, cognition takes place only insofar as information is being interpreted; the system does not interpret anything, and, if it does, this can only be considered a quasi-interpretation. KOS may be divided into different kinds of representation systems, (a) term lists, (b) classification and categorization systems, and (c) systems

with particular focus on relationships (Hodge, 2000), which may be elaborated even further by kind and granularity (Friedman & Thellefsen, 2011). As such, the basic functions of KOS are to facilitate information retrieval, provide information about documents, and provide shelf arrangements (ordering function; Broughton et al., 2005).

However, understanding KOS as systems of representation necessitates some explanatory comments on the concept "representation." Basically, we agree with Davis et al. (1993), who define representation within the context of information systems as knowledge representation (KR), and successively as a mode of thinking rather than acting. Consequently, Davis et al. argue that knowledge representation is a surrogate, whose function is to represent, or model, a part of reality by means of rationally structured sign systems in terms of information. These structured sign systems imply a set of ontological commitments, which determine how we may think about the world. This means that basically our understanding of the model becomes our understanding of the world. As such, the information system becomes a medium for efficient computation that recommends particular lines of inferences. A KR is thus a system that defines the fundamental informational structure of concepts, that sanctions a line of thought, and that recommends particular inferences. Furthermore, KR is considered a medium of human expression, a language that enables us to say things about the world.

Although there are some important nuances in relation to KOS, we consider KOS types of KR; however, KOS may be highly structured and universal, such as the Colon system (Ranganathan, 1960), or they may be based on ad hoc categorization that meets the needs of a particular group of users (e.g., folksonomies). However, although highly structured and formal systems are well-suited for computer processes, they tend to be less informative for humans. Consequently, when approaching an information system from the perspective of the system (the systems view), three types of sign systems emerge: (a) the sign system of the system itself, that is, the grammar of the system (syntax), the formal system of representation; (b) the sign system of meaning, the intended meaning of the information system's system of representation; and (c) the cognitive effect motivated by the system in a perceiving/interpreting mind.

The first type of system constitutes the structural, semantic layer of the information system. Thus, the system is formally organized and structured based on the rules of the system, binary coding at the lowest level and metadata structures at the highest level. Consequently, we may argue that this first type of system constitutes the fundamental grammar of the system.

The second type of system establishes, based on the first level, a semantic structure that implicates an intended meaning suggested to a user of the system, such as the organization of concepts based on a variety of semantic relations. At this level, we may argue that the information system communicates a particular meaning and motivates, at least intentionally, a certain user behavior.

The third type of system is beyond the control of the system. The cognitive effect, which is the result of the sign perception and interpretation, relies on the particular user's ability actually to understand the function and meaning of the information system.

Traditionally, the research conducted from the information systems perspective (the systems-oriented view) prioritizes the structure and performance of the system, optimizing search algorithms, thus focusing on relevance, recall, and precision. Fundamentally, the systems-oriented view promotes a rationalistic epistemology and probabilistic methodology and operates at the sign levels of syntax and semantics, which conform to altersense, the level of the informational significance effect. We recall that the informational sign can be iconic, indexical, or symbolic. Approaching information retrieval based exclusively at the level of the informational significance effect has the advantage of a controlled environment, objectivity, performance measures of such as search algorithms, predictability, and clear results. However, signification at the informational level is related to the objective or explicit side of information and ignores the emotional as well as the cognitional sign levels. We may, therefore, criticize the systems-oriented view for suboptimizing at the systems level, at the expense of neglecting that information is always information to someone. Hjørland (2010) argues that even the systems-oriented view, despite being perceived as objective, involves relevance criteria that implicate users' (expert users) relevance assessment, so systems performance cannot be evaluated by itself but is evaluated in relation to how well it performs for potential users of the system. Consequently, the systems view implies criteria for evaluation of systems performance that cannot in themselves be objective. However, an important difference in relation to the user-oriented view is that, even though information systems continuously are to be evaluated and improved by user feedback, the search algorithm performs without reasoning about what, how, or why particular documents are matched. Simply put, the threshold for assessing relevance is in principle generalized and as objective as any artefact.

The systems-oriented view is ultimately limited to the informational significance effect, the outer world, establishing the grammar and syntax of KOS. User interaction with an information system takes the form of a quasi-dialogue; in principle, the user is communicating with himself, by selecting between relevant and nonrelevant documents (cf. the Bach scholar example). We may argue from this perspective that the users ASK can be clarified by interacting with an information system. This, however, calls for some speculations about how information systems may support users in this process of clarification.

Understanding the Information Need

The concept of information need is more intricate, simply because the phenomenon resides within the cognitive space of the user. Within LIS, in particular, the concept

of ASK has been promoted in order to address the user's state of uncertainty and, thus, motivation for seeking information.

Seen from the perspective of the user, the first and second types of sign systems are identical. However, decoding the intended meaning of the information system also depends on the third type of sign system, namely, the particular users' expertise with information systems interaction and knowledge level (collateral experience). Significance effects, whether emotional, informational, or cognitional, thus become an integral part of information systems interaction. However, whereas the former perspective tends to prioritize the system's information architecture and formal representation of language, in principle ignoring the user, the latter tends to focus on the user's perception and sense making. Consequently, the successful systems interaction is considered a trade off between how well-focused an information system's design is, and if information architecture actually addresses the needs and demands of users, and how well knowledge possessed by users actually is stimulated by system interaction. In other words, how well the system in fact reflects the emotional and cognitional structures of the user.

However, the emotional and cognitional significance effects are brain waves, so user needs, knowledge structures, and ASK are understood in terms of information. Even though the user-oriented view explicitly addresses the concept of knowledge, and even the emotional state of the user (ASK in principle should be considered an emotional state), knowledge is conflated into the realm of information. The consequence is that ASK and information need are conceived as a state of mind that develops from a mental, inarticulate stage to an explicit stage that, with the right tools, can be expressed in the terms of the information system (Taylor, 1968).

Whereas the systems view gives priority to systems optimization, the user perspective gives priority to user information-seeking behavior, user tasks, and user interaction. The user is the priority; therefore, user information behavior is observed and evaluated. Whereas the information-seeking process in the systems view is considered in terms of objective relevance criteria as recall and precision, the information-seeking process in the user perspective is evaluated in terms of user satisfaction. However, as one might imagine, user satisfaction is inherently problematic, because the quality or correctness of the retrieved documents is not evaluated. Bad or wrong documents may also cause user satisfaction. Furthermore, users are different; some users are experts within the search domain, and others are novices, which means that knowledge about the work task and context of the information need is relative to different users. As pointed out by Hjørland (2010, p. 228), there is a paradox in that, "on the one hand, a user's relevance is considered purely individual, while on the other hand the researchers try to uncover general tendencies." The question is then whether individual users, at some cognitive level, exhibit a general information-retrieval behavior, which

remains to be uncovered. However, the paradox pointed out is similar to the problem of induction, how to discover generality from instances, a point made by Popper in his critique of logical positivism. Theories may be falsified, never verified, because of the problem of induction (Popper, 1968).

In relation to our theoretical framework of the significance effect, the emotional significance effect is subcognitive. However, as suggested, the emotional effect motivated by a given work task situation depends on experience, intuition, or what may be described as some kind of subcognitive recognition. The cognitional significance effect relates to the knowledge that the user possesses about the work task situation, and the user reflects his knowledge or expertise in the process of systems interaction. The system itself provides the informational level of significance, but how can we address the nature of knowledge possessed by the individual user without giving in to total subjective relativism?

There seems to be only one answer to this question, that is, the social context determining the information need that frames the work task situation, the context of systems interaction, and the character of the problem that motivates the information-seeking process. This is, in short, the universe of discourse.

Understanding the Universe of Discourse

The universe of discourse is defined as the socially framed or situated context in which the information-seeking activity takes place. The user's problem space or work task situation is anchored in a certain context that provides meaning, scope, and purpose to the information-seeking behavior. Deliberate information seeking is never random but purposeful and goal directed. Understanding the context of deliberate reasoning that gives rise to the formulation of a particular information need is thus imperative.

The communication model (see Figure 7) consequently implies different layers of communication activity, that of communication itself (signs are communicated to a perceiver, an interpreter), a second level that implicates a relative

informational effect (i.e., the communicated information is perceived as meaningful and relates to knowledge already possessed by the perceiver), and a third level of agreement, or, as Peirce (1977) would state it, "minds fused together" (pp. 196–197), an idea of conceptual alignment; the utterer and perceiver are in agreement about what is communicated, in sense of meaning, but not necessarily in agreement about the substance or consequences or even fundamental premises of the argument. This is represented in Figure 7.

Let us return to the library example used earlier, with the user not being familiar with the library system. The library system represented by the number on the bookshelf communicates the number to the user. The classification system becomes an utterer, and it contains an indirect intention, namely, to communicate that "if you are looking for a book concerning psychological topics you must look under 61.642." The system is indeed able to create an intentional interpretant, but only insofar as it is related to the system. We can call it a quasi-intentional interpretant. The sign communicated is 61.642. The interpreter is the person not familiar with the library system. He is wondering about the meaning of the number on the shelf. He can recognize the number as a number and he makes the hypothesis that it is some sort of code. Given the fact that all the books on the shelf have the same number, he makes the hypothesis that the 61.642 is a code for books concerning psychological topics. The success of his line of reasoning depends on his amount of collateral experience and his ability to create hypotheses based on his collateral experience, and that the universe of discourse is well defined. In this case, we can say that the systems view, the users view, and the universe of discourse are melded together in a meaning-creating process. Consequently, we maintain that any information-seeking theory must have all three perspectives in mind when creating information systems.

Ingwersen (1996), and Ingwersen and Järvelin (2005) argue that any act of communication involves a generator, a message, and a recipient. Accordingly, when the generator communicates a message to a recipient, the message carrying the intentionality, meaning, implicit context, and potential informativeness of the generator becomes stripped from intentionality, meaning, implicit context, and potential informativeness and falls into a linguistic surface level (Figure 8).

However, we argue that, even at the fundamental level of communication (Figure 7), where signs are uttered from a generator (utterer) to a recipient (interpreter), the recipient must interpret (or at least recognize) the communicated signs as signs of communication, even though he has not yet understood the intended meaning of the communication, which takes place successively at the next, more developed level of cognition. The communication model illustrated in Figure 6 conforms to the traditional transmission model of communication, originally formulated by Shannon and Weaver (1949). This model also considers the process of communication as a transference of a message from a generator to a recipient, in terms of signals or codes through a channel; and, at the receivers end, the process of

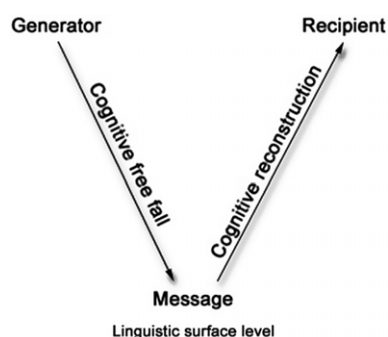


FIG. 7. Different layers of communication activity.

reconstructing the signals received starts in principle from a morphosyntactic–semantic level and is completed when the original message transmitted by the generator is reconstructed by the recipient.

However, the transference model (which includes the idea of cognitive free fall) neglects some important aspects of the communication process. Communication always takes place in a context (a universe of discourse). Furthermore, any communicator and interpreter (generator and receiver, if human) exhibits collateral experience, and therefore provides the communication process with intentionality (denotation and connotation at emotional, informational, and cognitive levels). In terms of interpretation, an interpreter at the lowest level of significance establishes an immediate interpretation of the communication process, thus perceiving the communicated signs as signs of meaning, not just signs of semantic structure, which at a subcognitive (emotional recognition) level involves collateral experience and knowledge about the universe of discourse.

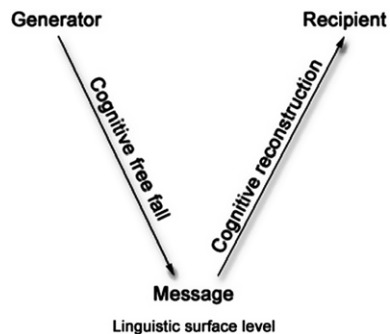


FIG. 8. The cognitive free fall illustrated. The only way the recipient can pick up the message from the free fall is by reconstructing the message based on his own cognitive abilities.

course. The problem with Ingwersen’s concept of cognitive free fall is that it assumes that communication fundamentally builds upon decontextualized morphosyntactic semantic codes and structures (as formulated by Shannon & Weaver, 1949) that must be reconstructed and contextualized from a syntactical surface level by a perceiving mind before any meaning is established (Figure 9).

We believe that the process of communication should be understood the other way around. Meaning emanates before syntax. Consequently, any process of communication involving human minds is perceived from a pragmatic level. Any acts of communication, even signs generated by computer screens, are perceived as signs of meaning before signs of syntax, and the cognitive process of meaning making thus precedes syntactical speculations. Of course, the process considered from the machine is stripped from meaning, intentionality, etc. The computer is no more than a sign generator; consequently, the idea of a cognitive free fall does not even apply to a strictly decontextualized data transmission context, such as computer systems transmitting data, because no cognition is taking place. It certainly does not apply to human agents, not even if the cognitive processes within the human brain are considered similar to “computing.” This false assumption connects the cognitive view to cognitive science.

The semeiotic approach to communication is skeptical of the notion of cognitive free fall, simply because the idea of communication stripped from intentionality, meaning, and context seems to be absurd. We consider the socially determined context a prerequisite condition if communication has to take place. Consequently, we also consider communication an activity that occurs only between minds, and the success of the communicative process is determined by the collateral experience shared by the communicators and the universe of discourse that delimits and determines the precise meaning of concepts.

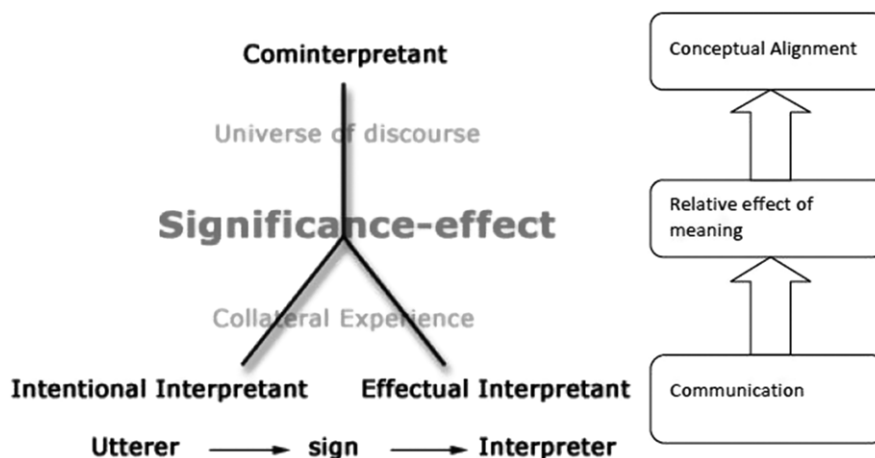


FIG. 9. Applying the levels of communication, relative effect of meaning, and conceptual alignment to the communication model clarifies the three dimensions of the communication process that horizontally implicate an utterer and an interpreter and vertically implicate a gradual level of understanding. The meaning generated within the interpreter’s mind is thus a relative product of the interpreter’s knowledge about what is communicated.

Conclusions

We have introduced our phenosemiotically-inspired concepts of emotion, information, and knowledge and have tried to argue for their role and function in the meaning-creation process as well as in communication. Furthermore, we have discussed how our phenosemiotical perspective relates to and influences our understanding of the systems view, the cognitive view, and a view based in a universe of discourse. We have, through our analysis of significance effects, related to the process of information retrieval, argued in favor of a phenosemiotical view that takes into account the fundamental layer of signification, the grammar of the system that provides for the structuring and representation of information (the KOS). Furthermore, we have demonstrated that the phenosemiotical view takes into account that signs are signs of meaning and that users interpret signs and use signs in their information-seeking activity, simply because the signs carry meaning to the user. However, the meaning of signs and the ability of users to interpret signs are related to the individual's level of collateral experience, which concerns both the user's experience with a particular KOS, and the user's knowledge about what is sought. Finally, the phenosemiotical view implies that, in addition to signs being signs (grammar) and signs being signs of meaning (semantics), signs are also interpreted from a perspective more general than the individual user's collateral experience (pragmatics). We argue that the universe of discourse expresses the overall frame for how signs are signs of meaning and frames the discourse of meaning. Consequently, we have to consider all three perspectives: the systems perspective, the user perspective, and the perspective of the universe of discourse in order to account for the intricate meaning-creation process that takes place when seeking information. We believe that our phenosemiotical view establishes a comprehensive, theoretical foundation for addressing the processes of information, communication, and knowledge, which we consider philosophically sound and practically relevant for the field of LIS.

References

- Belkin, N., Oddy, R.N., & Brooks, H.M. (1982). ASK for information retrieval: Part I. Background and theory. *Journal of Documentation* 38(2), 61–71. doi: 10.1108/eb026722.
- Brier, S. (1996). Cybersemiotics: A new interdisciplinary development applied to the problems of knowledge organisation and document retrieval in information science. *Journal of Documentation* 52(3), 296–344. doi: 10.1108/eb026970.
- Brier, S. (2004). Cybersemiotics and the problems of the information-processing paradigm as a candidate for a unified science of information behind library information science. *Library Trends* 52(3), 629–657.
- Brier, S. (2006). The foundation of LIS in information science and semiotics [Electronic version]. *Libreas* 06(1).
- Brier, S. (2008). *Cybersemiotics: Why information is not enough!* Toronto: University of Toronto Press.
- Broughton, V., Hansson, J., Hjørland, B., & López-Huerta, M.J. (2005). Knowledge organisation. *European Curriculum Reflections on Education in Library and Information Science* (pp. 133–148). Copenhagen: Royal School of Library and Information Science.
- Buckland, M. (1991). *Information and information systems*. New York: Praeger.
- Cabré, T.M. (2003). Theories of terminology: their description, prescription and explanation. *Terminology* 9(2), 163–199.
- Capurro, R., & Hjørland, B. (2003). The concept of information. *Annual Review of Information Science and Technology* 37, 343–411.
- Cornelius, I. (2004). Information and its philosophy. *Library Trends* 52(3), 377–386.
- Davis, R., Shrope, H., & Szolovits, P. (1993). What is a knowledge representation? [Electronic version]. *AI Magazine* 14(1), 17–33.
- Felber, H. (1984). *Terminology manual*. Vienna: Infoterm.
- Friedman, A., & Thellefsen, M. (2011). Concept theory and semiotics in knowledge organization. *Journal of Documentation* 67(4), 644–674. doi: 10.1108/00220411111145034.
- Hjørland, B. (1997). *Information seeking and subject representation*. Westport, CT: Greenwood Press.
- Hjørland, B. (2004). Domain analysis in information science. *Encyclopedia of library and information science*. New York: Marcel Dekker. doi: 10.1081/E-ELIS3-120043916.
- Hjørland, B. (2007). Semantics and knowledge organization. *Annual Review of Information Science and Technology* 41, 367–405.
- Hjørland, B. (2009). Concept theory. *Journal of the American Society for Information Science and Technology* 60(8), 1519–1536. doi: 10.1002/asi.21082.
- Hjørland, B. (2010). The foundation of the concept of relevance. *Journal of the American Society for Information Science and Technology* 61(2), 217–237. doi: 10.1002/asi.21261.
- Hodge, G. 2000. Systems of knowledge organization for digital libraries: Beyond traditional authority files [Electronic version]. Washington, DC: The Digital Library Federation. Retrieved from <http://www.clir.org/pubs/reports/pub91/reports/pub91/pub91.pdf>.
- Houser, N. (1983). Peirce's general taxonomy of consciousness. *Transactions of the Charles S. Peirce Society* 19(4), 331–360.
- Ingwersen, P. (1996). Cognitive perspectives of information retrieval interaction: Elements of a cognitive IR theory. *Journal of Documentation* 52(1), 3–50. doi: 10.1108/eb026960.
- Ingwersen, P., & Järvelin, K. (2005). *The turn. Integration of information seeking and retrieval in context*. Dordrecht: Springer.
- Kuhlthau, C.C. (1991). Inside the search process: Information seeking from the user's perspective. *Journal of the American Society for Information Science* 42(5), 361–371. doi: 10.1002/(SICI)1097-4571(199106)42:5<361::AID-ASIS6>3.0.CO;2-#.
- Liszka, J.J. (1996). *A General Introduction to the Semeiotic of Charles Sanders Peirce*. Bloomington and Indianapolis: Indiana University Press.
- Myking, J. (2001). Sign models in terminology: Tendencies and functions [electronic version]. *LSP & Professional Communication* 1(2), 45–62.
- Peirce, C.S. (1931–1958). *Collected papers*, vols. 1–6: C. Hartshorne & P. Weiss (eds.); vols. 7–8: A.W. Burks (ed.). Cambridge, MA: Harvard University Press.
- Peirce, C.S. (1977). Semiotic and Significs: The Correspondence Between Charles S. Peirce and Victoria Lady Welby. In: Charles S. Hardwick & J. Cook (eds.). Bloomington: Indiana University Press.
- Popper, K. (1968). *The logic of scientific discovery*. New York: Harper Torchbooks.
- Ranganathan, S.R. (1960). *Colon classification: Basic classification*. Bombay: Asia Publishing House.
- Sager, J.C. (1990). *A practical course in terminology processing*. Amsterdam: John Benjamins.
- Savan, D. (1981). Peirce's semiotic theory of emotion. In: L. Ketner (ed.). *Proceedings of the C. S. Peirce Bicentennial International Congress*. Lubbock, TX: Texas Tech University Press.
- Shannon, C., & Weaver, W. (1949). *The mathematical theory of communication*. Urbana, IL: University of Illinois Press.
- Taylor, R.S. (1968). Question-negotiation and information seeking in libraries. *College and Research Libraries* 29, 178–194.
- Thellefsen, M. (2004). Concepts and terminology reflected from a LIS perspective. How do we reflect meanings of concepts? In: *Knowledge and change. Proceedings of the 12th Nordic conference for information*

- and documentation. Sept. 1–3, 2004, Aalborg. Biblioteksarbejdes Skriftserie 14, 68–75.
- Thellefsen, T. (2010). A semiotic outline of significance-effect, fundamental sign and knowledge profiling and their use in knowledge organization and branding. Saarbrücken: VDM Verlag Dr. Müller.
- Thellefsen, T., Brier, B., & Thellefsen, M. (2003). Problems concerning the process of subject analysis and the practice of indexing: A semiotic and semantic approach towards user oriented needs in document representation and information searching. *Semiotica* 144(1). doi: 10.1515/semi.2003.022.
- Thellefsen, T., Sørensen, B., Danesi, M., & Andersen, C. (2007). A semeiotic note on branding [electronic version]. *Cybernetics and Human Knowing* 14(4), 59–69.
- Thellefsen, T., Sørensen, B., & Andersen, C. (2008). Emotion and community in a semeiotic perspective. *Semiotica* 172, 171–183. doi: 10.1515/SEMI.2008.093.
- Thellefsen, T., Sørensen, B., & Thellefsen, M. (2011). The significance effect—A communicational effect: Introducing the DynaCom. *Sign Systems Studies* 39(1), 209–223.

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