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The Sense of Information: Understanding the Cognitive Conditional Information Concept in relation to Information Acquisition

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Abstract. The cognitive information concept is outlined and discussed in relation to selected central conceptions associated to Library and Information Science (LIS). The paper discusses the implication of the conception to information acquisition, both in a narrow information seeking and retrieval sense as well as in more general terms concerned with daily-life situations and scientific discovery from sensory data.

1 Introduction

Information is one of the most central phenomena of interest to information seeking and retrieval (IS&R) and Information Science in general. Understanding information is an imperative for enhancing our conception of other central phenomena, such as, information need formation and development, relevance, knowledge representation, information acquisition, communication and use. Information is the glue that binds these concepts together. We regard IS&R processes to be an important activity of human information acquisition and cognition. IS&R may occur when an actor recognizes a knowledge gap [1] or a state of incompleteness, uncertainty or ASK [2] of itself and acquires information from external knowledge sources in connection to daily-life and work situations. In broad sense information acquisition engages both knowledge sources consisting of human-made signs – *and* involves sensory data as well.

Obviously, the outcome of human daily-life as well as scientific information acquisition is paramount to the further physical and intellectual activities of the actor in question. The understanding of what is nature-bound signals, data intentional signs, meaning, information, and knowledge, leading to cognition, is consequently of outmost importance to Information Science, since it deals with the latter activities.

We outline and discuss the conditional cognitive information concept, originally put forward by Ingwersen [3] and merely concerned with interactive information retrieval (IIR) as an Information Science discipline. We attempt to demonstrate that the

same conception can be generalized to cover IS&R as well as human information acquisition and cognition from sensory data, as performed during scientific discovery. Notwithstanding, the cognitive information conception does not intend to cover also pure bio-chemical phenomena and physical processes, which do not involve human actors.

The paper is organized as follows. First, the cognitive conditional information concept is briefly outlined and analyzed. This is followed by a discussion of its associations to other central information conceptions from LIS and related information-dependent disciplines, prior to an analysis of the conception in relation to meaning and information acquisition – with scientific discovery from sensory data as the study case.

2. The Cognitive Information Concept

Prerequisites for an information concept for Information Science and information acquisition in general are that it is must be related to knowledge, be definable and operational, i.e., non-situation specific, and it must offer a means for the prediction of effects of information. The latter implies that we are able to compare information, whether it is generated or received – and whether the processing device is man or machine. Hence, we are not looking for a definition of information but for an *understanding* and use of such a concept that may serve Information Science and does not contradict other information-related disciplines. However, at the same time it needs to be specific enough to contribute to the analysis of IS&R phenomena.

2.1 Information Acquisition in Context

Human acquisition of information from any kind of source demonstrates that communication processes play a fundamental role, involving sender, message, channel, recipient, and a degree of *shared context*. The special case for information science, and in particular IS&R lies in the notion of *desired information* and that messages take the form of *intentional signs*. Acquisition from sensory data is a special case of intentionality. A relevant information concept should consequently be associated with all components in the communication process and involve intentionality [4].

Essentially, both the generation *and* reception of information are acts of information processing made in *context* – Fig. 1 – but often at different linguistic levels, commonly known as: morpho-lexical; syntactic; semantic (or contextual); and cognitive (or epistemic) [3, p. 22-23]. All levels are nested. The former three levels belong to the 'linguistic surface levels of communication', Fig. 1. One should not be seduced by the (false) impression that recipients always are human actors. They may be generators as well as recipients and, quite importantly, computers or information systems may likewise play both roles, owing to their embedded (fixed) cognitive models representing a variety of actors.

Fig. 1 is an extension from Ingwersen [3, p. 33] by a) including different situation-specific contexts of generator and recipient, influencing their state of knowledge and cognitive-emotional model[1], and b) by viewing the act of communication at a given point in time, that is, at the instance of reception of signs. The contexts are open-ended, implying that factors from more remote contexts of the environment may influence the current ones (A and B) and the given situations.

At generation time, the situation in context A influences the generator's state of knowledge when producing a message of signs – the left-hand side, Fig. 1. Regardless whether the signs are stored for later communication, for instance in an information system, or immediately communicated, its meaning (sense) and context is lost – named the *cognitive free fall*. The generator has thus lost control of the message.

This is because the signs in the message fall back to a morpho-lexical state. They become data. The original (linguistic) conventions binding them together like grammar, cases and meaning (sense) are also present as signs themselves or have disappeared completely. A text or oral message simply becomes a string of signs, which have to be decoded by means of interpretation of a recipient, e.g., a reader.

That message is communicated at the linguistic surface level of the communication system. At the right-hand side the recipient perceives the signs at a linguistic surface level, in his/her/its context B. Only through the stages of information processing, and supported by the cognitive model of the recipient, may the message (signs) affect the current cognitive state of that recipient. In order to turn into information the signs must transform the cognitive state by means of interpretation. Indeed, the information perceived may be different from that intended by the generator.

The transformation is influenced by the open-ended situation in context B. Signs may indeed have effect on the recipient, but information may not be conceived. The cognitive-emotional state in context B may contain doubt, perceive a problem about the processing and/or interpretation of the signs, and reach a state of uncertainty. In itself this state could be said to hold information (on uncertainty or doubt), but then this information is of generic nature, e.g. "to me the signs seem to be of Asian origin – but I do not understand them".

In *human information processing* and acquisition the cognitive model is the individual cognitive space which controls the perception and further processing of external input, for instance, during communication and IS&R. The space consists of highly dynamic and interchangeable cognitive and emotional structures, including tacit knowledge. This individual cognitive space is determined by the individual perceptions and experiences gained over time in a social and historical context. In the actual situation the acquired information turns into IS&R knowledge and/or domain knowledge – the two knowledge types fundamental to all IS&R activities [3].[2]

In *automatic* (symbolic) *information processing* the cognitive model of the recipient may be dynamic but *not* self-contained. It consists of the human cognitive structures represented in the system prior to processing. Its individual cognitive structures, e.g., in the form of algorithms or textual strings of signs, may interact with one an-

[1] The notion 'cognitive' covers also emotions throughout the paper.

[2] In [3] domain knowledge was frequently also named 'conceptual knowledge', which includes emotions.

other and with structures generated by humans external to the system – when ordered and capable of doing so. However, the processing will only take place at a *linguistic surface level* of communication – at sign level – never at a cognitive level, see Fig.1.

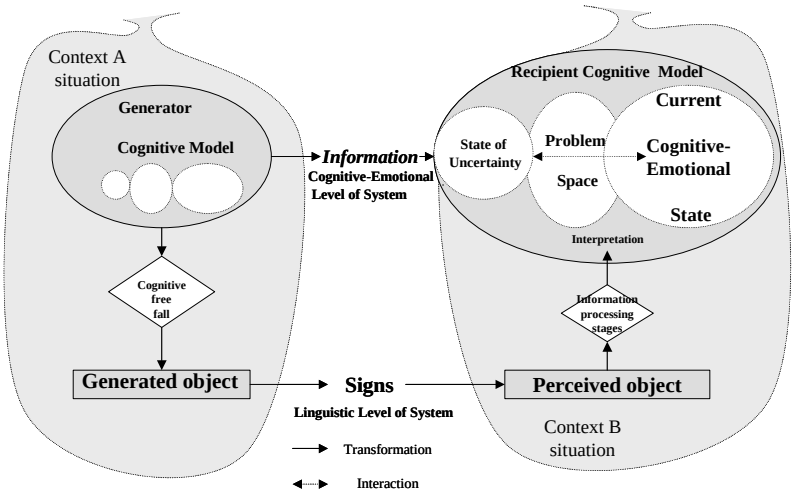

Fig. 1. The cognitive communication system for Information Science, IS&R and information acquisition in general. From [2] and revision of [3]

2.2 The Conditional Information Concept

With the above analysis in mind the concept of information, from the perspective of information science, must satisfy *two conditions* simultaneously [3, p 33]:

On the one hand information being something which is the
result of a transformation of a generator's knowledge structures
(by intentionality, model of recipients' states of knowledge, and in the form of signs),
and on the other hand being something which,
when perceived, affects and transforms the recipient's state of knowledge.

Evidently, any transformation of state of knowledge involves an effect on that state. It is important to stress, however, that an effect on state of knowledge, and an ensuing reaction, does not necessarily require any transformation of a knowledge state. When a computer starts printing due to a perceived and understood print command, it is simply an effect, not a change of state of knowledge. The command remains a sign – not information.

The information concept covers both human and symbolic information processing at both the generator and recipient side of the communication channel. It does not imply that the information acquired should be novel to the recipient or true. It may sim-

ply verify the already known. Verification adds to the state of certainty concerning some phenomenon – whereas falsification commonly signifies a radical change of state [5].

From this follows that in the four man-machine relations situations, only when the recipient is a human actor, communication of information *may* take place:

1. Human actor – machine communication, the conveyed data (message or potential information) remains signs at linguistic surface level;
2. Human actor – Human actor communication, the data (message or potential information) *may* turn into information in a cognitive sense, depending on state of knowledge of recipient actor;
3. Machine – human actor communication, the conveyed data (message or potential information) *may* turn into information in a cognitive sense, depending on state of knowledge of recipient actor;
4. Machine – machine communication, the conveyed data (message or potential information) remains signs at linguistic surface level.

2.3 Associated Central Information Conceptions

Between the conditions outlined above by the cognitive information conception a substantial range of concepts can be found [6]. The conditional information concept is strongly influenced by Wersig's analyses [7] by including the notions of problem space and state of uncertainty. It is originally an extension of Brookes' [8] equation and Belkin's [2] information concept. It reflects Belkin's two-level communication model and modifies slightly the idea of information as structure proposed in [2, p. 81]. Further, we explicitly include the contextual/semantic information processing level as part of the linguistic surface level. In particular Brookes equation [8] may offer a workable solution to understanding information acquisition from sensory data.

The majority of alternative conceptions pertinent to Information Science and IS&R associate to specific elements of the conditional cognitive conception and to portions of Fig. 1.

Shannon's information concept, which, to be more accurate, originally was a measure of probability for transfer of signals forming part of his mathematical theory of communication, is very limited in scope [9]. The measure is concerned with the *probability of the reception* of messages or signals in the form of bits through a channel, explicitly not with the semantic aspects of messages. Shannon's conception thus makes information equal to communicated signs (or electronic signals) at the linguistic surface level between generators and recipient. The measure cannot be applied to information seeking and retrieval where meaning in general is related to information. Neither intentionality nor any context exists according to the conception. Hence, neither condition one and two are necessarily satisfied and it cannot deal with acquisition of sensory data, only with data transfer.

Salton [10] identifies information with text *contents*, that is, information objects as represented by the inherent features, such as, words, image colors or (automatically extracted) index keys. Context is limited to such features within objects. This is what Buckland named Information-as-Thing [11]. Searchers may provide relevance feedback, but this fact does not indicate any notion of effect on the searcher, only on the

system. Salton's interest is to isolate generated messages (texts) conveyed by signs (words and other attributes) in organized channels (information systems). Hence, implicitly Salton recognizes that contents of information objects contain, carry or have *meaning* (are meaningful or have sense); otherwise the calculation of discriminating word frequencies in texts for indexing purposes would not be meaningful. In the framework of the conditional information conception Salton's notion of information equals the first condition: it is *intentional signs* placed at the linguistic surface level after the cognitive free fall on the generator side, Fig. 1. To Salton information systems are real information systems, not in any metaphorical sense. In practice most experimental researchers in IR base their feature-based search engine algorithms on independent features of objects, that is, at a morpho-lexical level. As a matter of fact, the so-called independence assumptions of document features and relevance assessments are here regarded absolutely necessary for the validity and understanding of common probabilistic IR models.

Ideas of information that regard value-added data as information, e.g. provided by human indexers by means of keyword structures, are close to Salton's conception. Pure documents are thus data, whilst organized information systems are value-added and real information systems. When perceived such entities become knowledge. The value-adding idea does not take into account the 'cognitive free fall' – also of the index terms and other added structures.

With Salton, Shannon and similar understandings the focus of the concept of information has moved from the areas of generated messages (contents of information objects) to the message in a channel (not its meaning). This drift in focus corresponds to a move from the left towards the center in Fig. 1, but at the linguistic surface level. Since none of these information concepts actually are concerned with human recipients, they cannot offer realistic solutions to understanding information acquisition from sensory data.

With Wersig [7] we reach the recipient side of the figure. He devotes attention to a concept associated with the reduction of uncertainty or doubt and the effect of a message on a recipient. Uncertainty (or doubt) is the end product of a *problematic situation*, in which knowledge and experience may not be sufficient in order to solve the doubt. It is important to note that Wersig's information concept operates in a situational and social context. His concept of information only vaguely deals with the senders' states of knowledge. But he extends his information concept and communication model to include the *meaning* of the communicated message, i.e., that it is intentional and makes sense, in order to explain the effect on the recipient: reducing uncertainty. In this concept a message 'has meaning', and may eventually 'give meaning' to the recipient. Only in the latter perspective does it offer explanations associated with acquisition of sensory data.

It is clear that the reduction of uncertainty is a relevant concept in the study of human actors (searchers) and their reasons for desire of information. Uncertainty reduction is but one of several ways a state of knowledge may change. However, it becomes unclear how this understanding of information may be related to generation processes and to non-human recipients, for instance, computers.

Recently Losee has discussed a quite generalized concept of information, suitable for all the disciplines or sciences treating 'information' in some way or another [12]. In order to accommodate the natural sciences and the issues of entropy his concept

has the general form: 'information is the result of a process'. This is not the same as Bateson's 'a difference that makes a difference' [13] because the latter difference is assumed created by man as an intellectual circumstance. To Losee any process, whether taking place in nature or instigated by a human actor, will thus result in information, regardless the kind of recipient. The recipient may be a natural artifact, i.e., a World 1 object in Popper's ontology [5]. For instance, it might be a DNA molecule. It may be a World 3 knowledge product, like computers or other signs structures, made by World 2 minds. Losee's concept implies that *all* signals, intentional as well as un-intentional, *are* information in a real sense. This conception corresponds to a heavily condensed cognitive information concept. Condition one is thus reduced to ad hoc signals and natural effectors that incorporate intentional signs as a special case. Condition two becomes reduced to perception and effect – by any kind of recipient.

Fundamentally, Losee takes Shannon's [9] signal theory and alters the meaning of information, signals and data merely to signify a substitution for a 'universal *effector* concept'. The notion of information is hence not needed at all. This is not fruitful to Information Science, although Losee may argue that in special cases or situations, effectors ('information') may indeed conform to the totality of the conditional concept of information. In that case one returns to the starting point: a concept of information for Information Science that may explain when 'something' is or is not information. Losee's concept can be workable with respect to sensory data acquisition at a very general level (has effect on a recipient of any kind).

In the case of entropy, information is commonly regarded as bits of signals that can be formalized. For instance, the more open a sentence is semantically and the more surprising, i.e., the less predictable it is, the larger the amount (bits) of information that is available in the sentence. In the inverse case, that the conveyed set of signals is highly predictable, the approach considers informativeness as very low (= close to zero number of bits). In this perspective, which derives from Shannon [9], information is an objective and quantifiable entity, and completely removed from any cognitive structure, i.e., not associated to interpretation, meaning, context and information in our common sense.[3] Owing to the lack of subjective perception and interpretation entropy offers understanding of (sensory) data acquisition at linguistic surface levels – not at cognitive levels.

Finally, Dretske maintains, like Salton, that the content of information systems *is* information [14]. When accessed, following Dretske's semantic information theory, information may provide meaning, that is, *make sense* to the recipient. Information is consequently reduced to intentional signs only – i.e., identical to the first condition alone of the cognitive information conception. Dretske's information concept equals Ingwersen's understanding of 'potential information', i.e., the signs, signals, data, etc. *prior* to any act of interpretation [3]. In terms of sensory data acquisition Dretske's conception does offer an understanding: when such data (un-intentional signals)

[3] In a search for 'dog', 'eats' and 'man' it is only known to the information seeker whether a text like 'dog eats man' is meaningful and more informative (due to the unpredictability or 'surprise' value following the entropy line of thought) than 'man eat dog'. Evidently, in a cognitive sense some socio-cultural context is required to determine which understanding of the two sentences that possesses the highest surprise value in an entropy sense. Then, the entropy is not as directly quantifiable and objective as assumed.

are perceived and make sense they are information entities that provide meaning, understood in a semantic sense.

2.4 Information and Meaning

One might argue that becoming informed is a purely social phenomenon, that is, that information similarly is socially dependent. This would imply that context (B), Fig. 1, or the socio-cultural and organizational context, Fig. 2, *determines* the act of becoming informed. From that perspective cognitive models reflect the social environment and its domain-dependent paradigmatic structures. In a cognitive sense, however, the processes of becoming informed are *not* beyond the control of the individual actor(s). In our view the actor(s) possess relative autonomy and therefore may – *influenced* by the environment – contribute to the change of a scientific domain, of professional work strategies and management, or indeed a paradigm. This combined bottom-up and top-down view of cognition is named the principle of complementary social and cognitive influence [15].

Without that principle scientific disciplines and schools, professional and social domains as well as ideas would and could not change over time. They would stagnate, remain introvert and promote the collective (semantic) understanding of the world as the only valid and true understanding. In the case of several 'schools' in a discipline they ignore or compete with one another. This behavior can be observed by citation studies. Such aspects of information transfer are central – in particular – when discussing information acquisition, whether from documents or sensory data.

The questions then are: how much context that necessarily must be shared between sender and recipient in order to make information acquisition work? – And how does social context and elements of cognitive models reflect on acquisition from (unintentional) sensory data?

To the first question at least so much context must be shared between the actors that the message makes sense to the recipient, i.e. gives meaning. Whether or not the intended information actually becomes conveyed depends on the perception and cognitive state of the receiving mind, influenced by the current situation in context. The more common context between actors, the higher the probability that intended information becomes transferred. This is the idea behind human indexing of documents, and refers back to the first condition of the cognitive information concept: the existence of a model of the future recipients in the mind of the generator. Most often, there is not the necessary context present at any given point in time.

The second question is discussed in the ensuing sections.

Meaning commonly signifies that a message makes sense to or is understood by an actor. At the cognitive stage of information processing information is seen as *supplementary* to the existing cognitive-emotional model of the individual actor. Thus, the information from a message deriving from a human knowledge source is basically the construct by association and *interpretation* of the perceived and understood message.

In this connotation of meaning there is no doubt that information goes *beyond meaning*. Old archives, history studies as well as archaeology or IS&R are full of problems of interpretation of ambiguous sources, due to the lack of adequate context surrounding such sources. This is the reason why modern archival practice attempts to

improve future sense-making and informativeness of the archive, and to avoid too much guess work, by adding sufficient context to the sources. The issue here on the thin line between meaning and information is: what is sufficient context to be shared? In some cases [16], owing to insufficient context in knowledge sources, we may observe an endless regression of meaning and interpretation; and new and creative use of expressions is inevitable.

However, jokes told within one culture are *only* fun due to the shared semantic memory, and a recognizable and understood situation. The slight twist of the shared context then creates the surprise and the significance – i.e., the unexpected sense (meaning) becomes the information and the gist of the joke. Here, we regard information as equal to meaning. Jokes can only with difficulty be transferred and provide the laugh (expression of information) in other communities or cultures, not sharing collectively the same context, although indeed linguistically understood. Similarly, deliberate misinformation builds often on known shared semantics from which the expected sense ought to lead to the desired interpretation by the recipients, i.e., to the desired (mis)construct in their minds. Misunderstanding of messages may lead to constructs different from the intended ones. In all these cases of false, wrong, or misinformation, we still talk about information as such.

But how does this bears on information acquisition from un-intentional sensory data? How is it possible to become informed from signals or signs created by nature?

3 Information Acquisition from Sensory Data

With respect to human acquisition of information from sensory data in daily-life situations none of the above Information Science conceptions focusing on the sender of meaningful messages, or on the communication channel alone, are applicable, the left hand side and center, Fig. 1. All conceptions dealing merely with the state of knowledge of recipients of signs are applicable, but only if the signs are allowed to be unintentional signals. If signs presuppose meaning in messages that will exclude sensory data. Left are thus the general information concepts that are not useful to Information Science.

The conditional cognitive information conception is quite workable in IS&R and the Information Science domain, but presupposes intentionality on the sides of the sender *and* recipient. A way to understand information acquisition from sensory data is to propose that the human recipient *simultaneously* act as a kind of go-between sender. Only in that way contexts can be shared between 'actors'. What is required is an *idea* or belief (a perspective) and some rule or logic concerning the original (unintentional) source, the matter and effect of the sensory data. The idea signifies some kind of statement that may lead to derived ideas and some methods for testing them: "The sun is warm, yellow and is seen circling around Earth close by. The stars are also yellow, but smaller and seem to stand still on the sky during the night, when the sun has gone away: The sun is on fire – more during summer than winter – and the stars are smaller fires fixed in the sky far form Earth. The moon is a less warm kind of sun, perhaps burned out, a ghost, even when it is full. Why this is so we do not know." If somebody then observes that the stars actually move around a fix point dur-

ing a year there might be new ideas about the nature of the celestial bodies. Somebody may even begin to work out some rules about their movements, i.e., making predictions.

What is important is that the idea (or belief) constitutes the shared context between incoming signals (regarded surface-level signs by the recipient) and the recipient. By putting a certain perspective to the perceived sensory data the recipient actor *superimposes* a specific way of making sense and interpretation of the data *as if* he/she had participated in creating them intentionally. The interpretation made by means of rules (conventions), experiences and logic signifies the information acquired. The idea and rules or test methods may be inadequate or completely wrong, or rather; they may start contradicting (what is perceived as) reality or other actors' perspectives of the same phenomena. They may indeed also prevail collectively, leading to similar interpretations for a long span of time.

Exactly this double-sided artificial way of manipulating the sensory data makes developments and changes in cognitive models of individuals possible in relation to context. The gained experiences can then be communicated as intentional messages via social interaction and/or other kinds of knowledge sources to other individuals.

3.1 Scientific Discovery

Scientific discovery follows the same route as in daily-life situations. The difference is that conventions exist for scientific inquiry for the variety of disciplines nowadays is more pointed than for common situations. The conventions assure a minimum of context to be shared scientists in between and between scientists and their objects of inquiry.

The scientist has commonly intentionality (goals), ideas and perhaps an already established theory. From that theory he/she may generate a hypothesis about objects and phenomena. For instance, Tycho Brahe was one of the last astronomers to make observations only by eyesight. He created a vast data collection of positions of the stars and known planets. At that time (late 16th Century) the commonly (semantic) recognized theory about the universe adhered to the so-called Ptolemaic cosmology with the Earth as center and the sun and stars turning around in spheres. The problem was that the planets did not behave as they were supposed to in their orbits, according to this prevailing cosmology shared by the scientific, philosophical and religious communities, see Fig. 2, right hand side. Their courses were erratic. The common hypothesis was that the observations available were not exact enough. Hence the cumbersome work by Tycho Brahe.

In a way we may say that his data collection activity was made in order to *verify* the prevailing theory or perspective (the Ptolemaic cosmology). The hope was the data would make sense, i.e., give improved understanding of reality as perceived during the period. Information would equal meaning. He did not himself manage to carry out the proper calculations of the new orbits. Copernicus did that later on and made a discovery of consequence! The observations did not suit the prevailing cosmology. In fact they suited much better an inverted cosmology, a completely different idea: that of the helio-centric system. The original observations – made for verifying and improving the original cosmology – succeeded in *falsifying* that theory and to suggest a

more suitable one. The same observations were later also used by Keppler to produce his Laws.

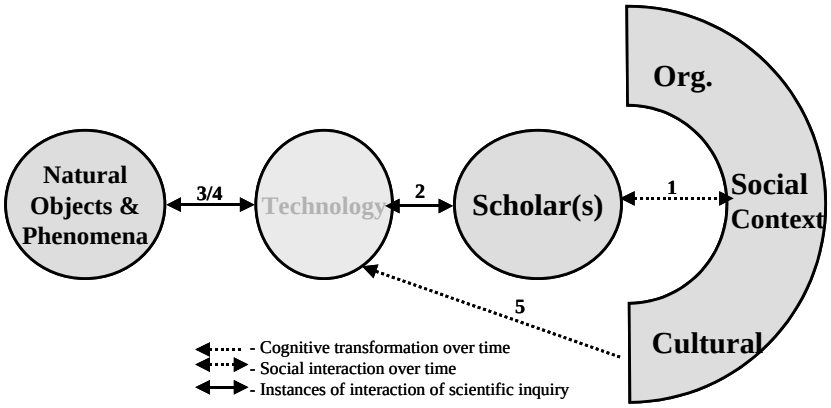

Fig. 2. Cognitive framework for instances of scientific information acquisition from sensory data [15]

To Tycho Brahe starlight and his observations of star positions were built on a *hypothesis* (albeit wrong) that guided his way of making the observations. He consequently concentrated his attention on specific patterns of that light and superimposed *his* intentionality on the flow of data. He thus became a generator, substituting the originator from nature, *and* recipient at the same time of the incoming signals. They turned into signs intentionally structured according to the hypothesis (the cognitive model of the recipient actor). Condition one of the cognitive information conception is hence fulfilled although the data originates un-intentionally from natural phenomena and objects.

The same data set may provide very different information constructs, cognition and knowledge, later to be put into theoretical patterns that may produce novel hypotheses. It all depends on the nature of the *pre-suppositions* and context that are applied as well as creativity and courage to allow a falsification to lead to unexpected conclusions. The danger of this construct is that it may lead to social constructivism or scientific relativism where the prevailing pre-suppositions are stronger than the sense of truth, logic and fairness towards reality. This is also the basic reason behind making available the data sets used in empirical research, as required, e.g., by the journals Nature and Science. In that way, by scientific convention, comparisons can be made between hypotheses, the data collection, the methods used for obtaining that collection and the ensuing results, conclusions and perspectives *and* competing approaches to the same issues. In more analytic disciplines and research traditions, the interpretative elements and speculation are more in front. But comparisons can still be made via logic, communication and academic discussion. In disciplines not dealing directly with sensory data originating form nature, but concerned with the interpretations of such phenomena in the form of knowledge sources (documents), like in History, Literature History, etc., there exists a human originator. However, most often the scientists in those domains also play the ‘go-between’ the original data and him or herself,

in order to manipulate the interpretation. That is why so many interpretations do occur for the same event.

In a general sense Fig. 2 illustrates instances of scientific information acquisition [15]. The scientist interacts with and is influenced by his/her own domain context, including colleagues, recorded knowledge, prevailing research beliefs and traditions of that domain over time, arrow (1). To the left the scientist interacts with the natural phenomena under investigation – arrows (2) and (3/4) – carrying out information acquisition. This situation of scientific inquiry increasingly involves complex technological tools produced by other actors – arrow (5). If the technology component does not exist, however, the model becomes even more simplistic with direct interaction between man and nature – arrows (2=3/4). This was indeed the case in Astronomy during the period of Tycho Brahe prior to the invention of the binocular. If Fig. 2 is intended to depict information acquisition from man-made signs, the component 'Natural Objects & Phenomena' becomes replaced by the notion Information Objects.

4. Concluding Remarks

We have shown that the conditional information conception, originally designed by Ingwersen [3] with a specific Information Science purpose in mind, also is capable of explaining information acquisition from un-intentional signs created by nature. We have also demonstrated that there are alternative information conceptions within and associated to Information Science that do not display similar characteristics. They are either very general concepts of information, and thus not useful to Information Science and IS&R, or they commonly are not concerned with the reception of sensory data. The reason why such data are important is that they constitute the primary source for knowledge generation and thus for the generation of information objects. Consequently, it is of interest when an information concept in Information Science also may cover this central aspect of the information flow and transfer.

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