A Human Information Behavior Approach to a Philosophy of Information

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Abstract

This paper outlines the relation between philosophy of information (PI) and human information behavior (HIB). In this paper, we first briefly outline the basic constructs and approaches of PI and HIB. We argue that a strong relation exists between PI and HIB, as both are exploring the concept of information and premise information as a fundamental concept basic to human existence. We then exemplify that a heuristic approach to PI integrates the HIB view of information as a cognitive human-initiated process by presenting a specific cognitive architecture for information initiation based on modular notion from HIB/evolutionary psychology and the vacuum mechanism from PI.

Introduction

Many disciplines are grappling with the concept of information in the information age. Researchers in library and information science (LIS) are using tools from hermeneutics, cybernetics, and semiotics to define its parameters and nature (Herold, 2001). However, there is also a need to examine the subject from a broader perspective, as Herold (2001) suggests within the emerging field called philosophy of information (PI).

As well as providing LIS with a broader perspective on the question of information, PI provides an alternative to LIS's reliance on computer science and its diverse theoretical orientations such as the philosophy of computer science, the philosophy of computing or computation, the philosophy of artificial intelligence (AI), etc. (Floridi, 2002b). The primary proponent of PI is Floridi (2002a, b). Floridi argues that AI acted as a "Tro-

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jan horse," bringing a computational/informational paradigm into philosophy (i.e., with its own subjects, methods, and models, and its own perspective on traditional philosophical concepts such as the mind, consciousness, experience, knowledge, truth, etc. (Bynum & Moor, 1998). As a result of AI, information "acquired the nature of a primary phenomenon" (Floridi, 2002b). However, in PI, information, not AI's primary concept computation, becomes the more fundamental concept.

Our paper discusses the relationship between PI and human information behavior (HIB), which is a developing perspective in LIS. A strong relation exists between PI and HIB, as both explore the concept of information as a fundamental human concept that defines human existence and gives life meaning. Specifically, we argue that the HIB perspective or approach facilitates the occurrence of LIS's role as applied PI, as suggested by Herold (2001) and Floridi (2002a).

As an applied form of PI, the HIB perspective in LIS should concern itself with the design of services and systems that facilitate the role of information in human existence. In effect, this widens information retrieval (IR) design's traditional emphasis on the focused information seeking/searching behavior of individuals, predominantly in the school or workplace. The Internet and its ability to offer information to a wide range of people at work, school, but most importantly at home, have widened LIS's definition of its role to the home information situation as well—for example, the seeking of health information that is widely available on the Web. Other forms of home information-seeking behavior, such as surfing the Web without real purpose and with constantly shifting tactical goals, are widening LIS's definition of its role still further (e.g., Spink et al., in press).

HIB looks at the entire human condition, thus expanding information and its role in human life to its widest possible level. Why do we seek information all the time, often without apparent reason, often without even being aware of it, seemingly for its own sake? HIB answers the question by linking the human condition and information together. Information and information acquisition are seen as fundamental to human existence, enabling us to constantly adapt so that we can survive in an ever-changing physical and social environment (Spink & Cole, in press). This broad, fundamental perspective makes HIB the ideal LIS perspective through which the tenets and theoretical constructs of PI can be applied to theoretical and real-world information-related problems.

In this article, we link the basic constructs and approaches of PI to parallel constructs in HIB. We further argue that a heuristic approach to PI should account for and integrate the HIB view of information as a cognitive human-initiated process. We then provide an example of an HIB approach to information as a human-initiated cognitive process, based on HIB's developing modular approach to human information/cognitive architecture.

PI

Floridi's approach to a PI starts from the view that information in the information age has become "a concept as fundamental and philosophically important as 'being,' 'knowledge,' 'life,' 'intelligence,' 'meaning,' or 'moral good and evil.' All these pivotal concepts are interdependent with information and are equally worthy of autonomous investigation" (Floridi, 2002a). Therefore, Floridi (2002a) suggests that such a fundamental concept requires a new field of research.

Floridi defines the emerging field of PI research as the "philosophical field concerned with (a) the critical investigation of the conceptual nature and basic principles of information, including its dynamics, utilization, and sciences and (b) the elaboration and application of information-theoretic and computational methodologies to philosophical problems" (Floridi, 2002b, p. 137). Included in (a) and (b) is a prescriptive function: "PI is prescriptive about, and legislates on, what may count as information, and how information should be adequately created, processed, managed, and used" (Floridi, 2002a, p. 44).

Information's Conceptual Nature in PI

For information's conceptual nature in a PI, Floridi gives basic principles of information and its role in the human condition. For our present purposes, we define the human condition as the set of human needs and the consequences that occur as a result of those needs. According to Floridi (2002b), the human mind "needs to make sense of its environment by continuously investing data (affordances) with meaning" (p. 129). Floridi gives reasons for this need that we will not go into here. The process through which humans make meaning out of our physical world is set off by four conceptual thrusts.

- A metasemanticization of human narrative by putting oneself into the narrative.
- A sharing of the narrative with others through language and other information entities like documents.
- A dephysicalization of nature whereby the physical world is virtualized when we include it, and all the objects in it, in the narrative. We first manipulate objects by manipulating their virtual form in the narrative.
- A hypostatization (embodiment) of the concepts, in the narrative, we devise to explain reality, making them as real, in the narrative, as objects from the physical world.

Information, defined as meaningful data (Floridi, 2002b), plays a predominant role in these four conceptual thrusts, creating three "dynamics" or subsidiary processes by which the conceptual thrusts are carried out. This includes what are called "information life cycles," or the stages "through which information can pass, from its initial occurrence to its final utiliza-

tion. . . ." (Floridi, 2002b, p. 138). Floridi mentions briefly, when citing Dummett (1993, p. 186), that information, because it is partly a perceptual process, may start "without one's necessarily having a grasp of the proposition which embodies it."

LIS as Applied PI

Floridi (2002a) outlines the role LIS can play in applying the PI's conceptual principles by first indicating LIS's evolution toward a view of information and the role that information plays that is similar to the history of philosophy, and its evolution toward PI. In the history of philosophy, information has become a more fundamental concept than knowledge, and this due to a long line of philosophers beginning in the seventeenth century who made the switch from focusing on the nature of the knowledge object—i.e., metaphysics—to the relation between object and knowing subject—i.e., epistemology.

Floridi (2002a) outlines a similar switch in LIS, relying on Shera (1961). Social epistemology (SE), argues Shera, is divided into the Sociology of Knowledge (SoK) and the Epistemology of Social Knowledge (ESK). LIS emphasizes the latter, which is the "critical and conceptual study of the social (multi-agents) dimensions of knowledge" (Floridi, 2002a, p. 39). Shera believed that LIS is the discipline that manages knowledge, but particularly "the way in which knowledge is disseminated through a society and influences group behavior" (Shera, 1961). Shera believed that the role of LIS was an applied ESK.

Floridi (2002a), however, believes a conflict exists between ESK, which is knowledge-centric, and LIS, which is actually information sources-centered. He describes the difference as LIS being concerned with the role of information sources in enabling knowledge to occur. Floridi, following Herold (2001), believes that because ESK is knowledge-centric rather than information-centric, therefore, PI would be a better philosophical home for LIS.

Since Brookes (1980), LIS has used Popper's (1975) Three Worlds concept to describe a more general theory of information exchange. Briefly, Popper's notion of Three Worlds describes the problem solver grasping for understanding (World 2) of the physical world (World 1) to produce the concepts and ideas that make up knowledge about that physical world in recorded documents (World 3). It also works the other way, describing a person's interaction with World 3 in books and documents to acquire information/knowledge about the physical world (World 1).

Before LIS focused on the production, organization, and dissemination (distribution) of recorded information, primarily document production, organization, and delivery. The benefit of making information fundamental is that it recognizes the two positions mentioned by Shera and the two forces that remain in LIS. First, the social production and distribution of

information. Second, the individual's psychological acquisition and production of information. By making information fundamental for survival, they join at one point.

The traditional perspective has the observer examining World 1. However, the place of previous work on the part of the world this observer is examining has become paramount. The researcher finds some sort of problem in World 1 for which he or she wishes to do more research. The researcher first goes to the literature to investigate the problem (World 3). The process or stages whereby the problem solver reaches for an understanding of World 1 via recorded knowledge is theoretically defined by Popper (1975) in his schema of conjectures and refutations:

$P_1 >> TT >> EE >> P_2$ and repeat until problem solved . . .

P_1 is a conceptualization of the problem. In the Popper schema, the problem solver begins with a conceptualization of the problem (P_1), then interacts with the world of information objects (World 3), including text, to arrive at a state of understanding, a conjecture, or tentative theory (TT) about the problem and its solution. In the final stage of the schema, the problem solver tests the conjecture for error elimination (EE) before arriving at a revised conceptualization of the problem (P_2). The problem solver repeats this process until the problem is either solved or he/she quits the problem.

The problem Popper's schema poses is the first round conceptualization of the problem (P_1), which results from the person interacting with both World 1 and the objectification of theories, concepts, and principles from the human study of World 1 in the human knowledge record (World 3). In Herold's (2001) description, the preproblem actualization state and information is pre- or a-categorical:

> Information is: A-categorical. Information happens without pre-definition into certain or rigid structures, orders, or classes in any exclusive or preferred way. Information is rich in potential taxonomies and capable of varying interpretation schematically, while at the same time conditional and dependent in the sense of not having an assigned final status. (p. 1)

Both PI and HIB look at and comment on the information problem conceptualizing stage through a perspective of theories, concepts, and principles that offer LIS solutions to users' information problems:

- The PI principle of human sense-making that drives the individual to invest unmeaningful data in the environment with meaning, but in HIB it also has the evolutionary function of enabling human adaptation to changes in the environment (signaled by data in the environment that has not been previously invested with meaning) for purposes of ensuring human survival.

- The concept of information being a process (Buckland, 1991), the instantiation of which is started by some sort of interaction with the environment (Popper's World 1), or recorded knowledge or other information objects (Popper's World 3); this process can be divided into phases (in HIB, e.g., Popper's [1975] schema of conjectures and refutations), stages, or cycles (in PI, cf. Floridi, 2002b, p. 138).
- The shared PI-HIB concept of a data-information-knowledge continuum to describe the whole range of HIB, with data being more important in the early, conceptualization phase of human meaning creation (PI), problem solving, and adaptation to new or transformed features of the environment (HIB), and knowledge being more important in the later phase of meaning-knowledge production and human adaptation to the environment, for example, in Popper's (1975) EE phase in his schema of conjectures and refutations (described above) where a researcher's conjecture is tested before it is placed by the researcher in the knowledge canon.
- The HIB principle of uncertainty, an information theoretic concept (Shannon & Weaver, 1949), but increasingly used in LIS by Kuhlthau (1993) and Wilson et al. (2002).

To develop this issue further, the next section of the paper discusses and extends the Spink and Cole (2002) unified theory of HIB as the human-information basis for the application of principles and concepts from PI.

Unified Theory of HIB

The Spink and Cole (in press) unified theory of HIB provides a basis for applying PI theories, concepts, and principles to LIS methods and practice, particularly the methods and practice of creating systems to facilitate user access to information via IR systems.

The Spink and Cole HIB theory integrates the four principal LIS information approaches that framework user information-seeking: the user as problem solver, sense-maker, everyday life information-seeker, and information forager; HIB accomplishes the integration by using theories, concepts, and principles from evolutionary psychology to widen the traditional LIS perspective to a perspective on the total human information condition.

The principles and issues that have arisen from recent advances in evolutionary psychology widen the traditional LIS focus on information-seeking and problem-solving, not only by indicating that other forms of HIB are ignored by the current LIS information-seeking paradigm, but also by setting a prehistorical framework for the human information condition, one that operates as a constant throughout the history of human-information interaction. The most important implication of the evolutionary psychology perspective, however, is its elevation in status of information need from

a secondary to a fundamental human need, due to the primacy that evolutionary psychology gives to information foraging for human adaptation and survival.

The Spink and Cole HIB theory utilizes the evolutionary psychology perspective on the human condition to integrate four information-seeking approaches. The integrated theory of HIB attempts to be a global, more fundamental theory of information behavior, in which the four current information science information behavior approaches find their place as part of a description of the human "information condition."

The Spink and Cole HIB theory is based on some sort of human state (preattentional, a problem state, a need state, etc.) being actualized by uncertainty, which acts as an energy input moving the human state along a "data-information-knowledge" continuum. High uncertainty is linked to a preattentional state of information foraging for adaptation and survival, while low uncertainty is linked to information behaviors whose purpose is knowledge (e.g., the common sense precepts by which most of us live in everyday life, or make sense of life).

The next section of the paper discusses the implications of HIB's adaptation of evolutionary psychology's modular cognitive architecture on HIB and PI.

Implications of Modular Cognitive Architecture on HIB Processes

Modular: Metaphor: The Process of Information Acquisition in Evolutionary Psychology

Homo sapiens are unique among species in their ability to think symbolically, representing the world around them in terms of symbolic images. This ability allows us to think in the past and to think about, even plan and therefore influence, our future. The ability to control our destiny through predictive thinking gives us a decided advantage in terms of survival and adaptation to a changing environment.

Two views are taken about how we evolved to our present state: (a) that our ability to represent the world symbolically was gradual, created by culture or (b) that 30,000 to 50,000 years ago a chance mutation occurred in human cognition that led to a sudden change in how we were hard-wired, giving us the ability to think in symbolic representations (Mithen, 1996, p. 42); this, in turn, led to our transformation from being one among many species competing for limited resources to a species so clever that it is now almost a "geological force" in the world (Wilford, 2002). We take the second view in this article, that a dramatic revolution in human cognition resulted from a chance mutation occurring in our cognitive apparatus some 30,000–50,000 years ago that established the way humans think and conduct HIBs up to the present day.

The chance mutation led to the human ability to think representationally, or symbolically, leading to language, art, religion, information behavior, and eventually science. It also allowed humans to think in the past, construct problem solutions over time in the present, and think into the future, via these representations. These representations also allowed humans to predict behavior based on past experiences. The ways these representations were constructed induced Homo sapiens to engage in a certain kind of information behavior that we will broadly define here as (a) information behavior for some immediate purpose and (b) information behavior for no immediate purpose, but which, in the context of our hunter-gatherer ancestor, allowed Homo sapiens to adapt their behavior and survive. It does this through its cognitive architecture, which has several important features according to modular theorists.

The first feature is that the cognitive architecture is designed to be adaptive. Essential to the notion of adaptation for survival is the ability to transform your way of thinking so that in effect you see the world or at least a part of the world differently, which means that information acquisition is controlled by a cognitive architecture that can be described as a generative system (Boden, 1998). Tooby and Cosmides (1992) describe a modular architecture capable of generating new information about the subtle kinds of issues related to social interaction, by combining together from disparate pieces of nonpurposive data both consciously and unconsciously collected by the hunter-gatherer over the course of time. The architecture must be able to bring these floating pieces of data together, perhaps because of an entirely new stimulus that causes them to come together (Renfrew, 1998), resulting in the production of a transformed or new way of looking at the world, adaptation, and increased chances of survival.

Lake (1998) divides these adaptations into both improbable and impossible transformations. An example of improbabilist learning or association (Renfrew, 1998) is the transformation of the hunter-gatherer's use of the horse as a food source to using it as traction or transportation. This occurred sometime before 1200 B.C. when we first see these representations depicted in artifacts. Before this time, the horse was domesticated as a source of food, and oxen pulled the carts. Funerals in complex hunter-gatherer societies were used as social messaging events, to create alliances "by advertising the success of the deceased's kin group" (Schulting, 1998). The change in using the horse from food to mode of traction occurred as a result of funeral ceremonies where horses were used to pull ceremonial carts with the bodies of rich men to indicate to other members of the group the rich man's social position.

Based on impossibilist learning or association, Bradley (1998) believes that the change in funeral monuments from monuments that did not require the alteration of the natural state of the raw materials used—like using boulders or large rocks that required only accurate planning and measure-

ment to transport them to the site and position them—to where the raw material itself was modified, constituted a radical transformation in the structure of man's relationship with nature and the natural world.

In the evolutionary psychology view of human development and behavior we take here, what allowed improbabilist and impossiblist learning or change to occur was a chance genetic mutation 30,000–50,000 years ago, which caused a change in the hard-wiring of Homo sapiens. Mithen (1996) hypothesizes about the effect of this chance mutation. He believes, essentially, that the various intelligence modules of the Homo sapiens cognitive apparatus, formerly separated and independent, suddenly developed an integration mechanism that allowed knowledge and memory data from one module to flow into another.

Integration Mechanism in Modular Thinking

The mechanism of creating symbolic markings is due to, according to Mithen's thesis, the modular architecture of human intelligence. Because of this architecture, the various types of thinking have their own separate modules (made up of module specific rules and memory links). Mithen (1996) hypothesizes that the Homo sapiens cognitive mechanism is divided into four intelligence modules, each in charge of a certain kind of intelligence cognition, but all connected to a general intelligence base (containing general-purpose learning and decision-making rules). The four Mithen intelligence modules are

- a technical intelligence module (tool making, technology);
- a linguistic intelligence module (language acquisition and use);
- a social intelligence module (group dynamics, Machiavellian behavior, empathetic behavior); and
- a natural history intelligence module (about animals, plants, and geography; mental maps and hunting behavior).

According to one theory, some chance mutation in human cognitive architecture, called the Big Bang, allowed data or information to flow between the modules, creating a type of metaphorical thinking (as data or information from the sender module would, by definition, be metaphorical or introduce metaphorical thinking of some sort to the destination module in this flow). The modular notion of cognitive architecture and the flow of data from one module into another, when seeking information for adaptation and survival, are based on broad definition of metaphor as involving all types of human thinking that transform unmeaningful data in the environment into meaningful information.

Metaphorical Thinking

The current research approaches in LIS are largely attentional—that is, they assume that even if we are passively seeking information, we are paying attention to the stimuli on some level, like acquiring information

while watching TV or aimlessly surfing the Internet. Evolutionary psychology, on the other hand, posits a type of information foraging where information is acquired without attending to it. Perhaps unattended-to information or data is somehow attached to other information we are attending to. This may be the basis of what we have termed here "metaphorical thinking."

In effect, all representational thinking and communication are metaphorical. When we attempt to represent reality using symbolic forms, like a cartographic mapping of a geographical area, the representational nature of the symbols used to achieve this is necessarily metaphorical—i.e., the blue color used to indicate an ocean, a line to represent the coastline and the green color used on the other side of the line to indicate land; all these symbols are metaphors trying to represent the actual physical form.

Lakoff and Johnson (1980) suggest that "the essence of metaphor is understanding and experiencing one kind of thing in terms of another." Metaphors are not mental models. However, metaphors are an important phase between intuitive model formation and mental models (Hill & Levenhagen, 1995), allowing us to fill in missing details in our comprehension of a concept, event, or object (Lakoff & Johnson, 1980). They thus help us to bridge the gap between what we do and do not know (Hill & Levenhagen, 1995). Metaphors can form a link between left- and right-brain thought, or theory-in-use and theory.

Metaphor Priming the Pump

In the Spink and Cole HIB theory, we used a continuum of data-information-knowledge, and the image of a tap and uncertainty/water energizing a pump that drives the mental state of information user into data foraging mode, an information-seeking mode or a knowledge creation mode of HIB. Metaphor causes superordinate category instantiation, like priming a pump, creating new properties to flow from its home module to the topic module. The topic module is the module that is controlling the attention of the individual at the moment the pump is primed by metaphorical or intermodular data flow. Suddenly, the person's acategorical thinking (defined by Herold [2001] and cited above) assumes some category definition as a result of this flow, but it would probably, we assume, be a superordinate category of some kind that jump starts topic category formation based on a sudden information process, which is, in turn, based on this category conceptualization process—i.e., there is an inclusion, or class inclusion process mechanism connected to the process (Glucksberg et al., 1997). It does this by promoting abstractions rather than specificity (cf. also, Lowenstein et al., 1999).

After the metaphor priming of the pump occurs, we assume that the result of the process is that the superordinate category and the abstraction of the category effectuated by the process create a structure containing the following:

1. Dimensions of category (Glucksberg et al., 1997).
2. It provides relevance criteria.
3. Therefore, it provides relevance dimensions for subsequent information seeking, search, and use.

Conclusion

In this article, we have attempted to describe the relationship between HIB and PI. Extending our theory of HIB, we discuss what occurs when, based on modular cognitive architecture and evolutionary psychology theoretic principles, a person's information behavior and thinking mechanism leads to adaptation of the human organism to new or unmeaningful data in the environment for the purpose of ensuring survival in the environment. In this type of behavior, the human gathers or forages for data constantly, without awareness, and for no purpose other than adaptation to the environment for survival. So the person is very sensitive to the environment as this behavior is constant and does not demand attentional mechanisms needed for other types of more search-oriented information behavior.

According to one theory, the Big Bang in human thinking allowed the interflowing of modular data from one module to the other, thus creating the ability for human metaphorical thinking. In this article, we have attempted to describe how metaphorical thinking causes this interflow, leading to the facilitation of human adaptation to changes in the environment. We assume that this process, or something like this process, underlies all original thinking in both the human species and at the level of the individual human organism—i.e., modular and metaphorical thinking is the mechanism that allows the single individual to survive by adapting in the group and in his/her environmental framework.

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