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Conceptualization of Various and Conflicting Notions of Information

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Abstract

Three principal uses of information are identified as *Information-as-process*, *Information-as-knowledge*, and *Information-as-thing.* Such a typology has received great interest over the last ten years and been described as an insightful and useful contribution. Still, the proposed framework is characterized by generality that provides insufficient precision to serve as a foundation for information studies. This paper revisits the notion of "information" in general and information-as-thing in particular to present a new approach to conceptualizing of information schemes. The approach is based on the notion of "things that flow" ("flowthings"), e.g., information, data, and signals, and centers on an important characteristic of these things: liquidity (the state of being liquid). A flowthing flows in its flowsystem and triggers flowsystems of other flowthings. Accordingly, mental information triggers the flow of physical representations (signs) that flow to others' flowsystems. These concepts are applied to the known semiotic triangle. The resulting conceptual picture clarifies the sequence of ontological spaces and their relationships associated with the concept of information.

Keywords: Information definition, information concept, conceptual representation, information as thing, information-as-process, information-as-knowledge, information-as-things-that-flow

Introduction

The question "what is information?" seems to have no single answer in spite of a consistent stream of research work in a variety of disciplines such as biology, psychology, computer science, sociology, economics, business and management, political science, artificial intelligence, statistics, philosophy, and communication studies. A good review of the notion of information in these fields can be found in Vreeken (2002) and Callaos and Callaos (2002). Additionally, the current fundamental transformation of the world caused by information and communication technology motivates re-examination of such a basic notion. "Information is recognized, at least by some, as the third essence that supplements matter and energy in viewing the universe; it describes its structural aspects represented by patterns" (Gackowski, 2010).

The colloquial use of the term *information* causes uncertainty when used to mean different things to different people; nevertheless, it is important to address this notion of information because it is the heart of information technology production and processing. The aim of this paper is to offer a new approach to

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viewing information based on recent research in types of systems called systems of things that flow.

The direct cause of this interest in the concept of information is a notion propounded over the last ten years that views information as *thing*. In an article titled "Information as Thing," Buckland (1991a) states,

> Faced with the variety of meanings of "information", we can, at least, take a pragmatic approach. We can survey the landscape and seek to identify groupings of uses of the term "information". The definitions may not be fully satisfactory, the boundaries between these uses may be indistinct, and such an approach could not satisfy anyone determined to establish the one correct meaning of "information." But if the principal uses can be identified, sorted, and characterized, then some progress might be made.

Buckland (1991a) then identifies three principal uses: *Information-as-process (inform), Information-as-knowledge (facts, news),* and *Information-as-thing (*data and documents). Buckland *argues against* objections to "information" denoting a thing (e.g., Fairthorne, 1954; Machlup, 1983):

> Indeed, languages evolve and with the expansion of information technology, the practice of referring to communications, databases, books, and the like, as "information" appears to be becoming commoner …. Further, "information-as-thing", by whatever name, is of special interest in relation to information systems because ultimately information systems, including "expert systems" and information retrieval systems, can deal directly with information *only* in this sense.

Andrew Gianni (2005) describes these three uses as *states* of information:

> Most matter can exist in different phases or states. Molecules must go through a phase transition to move from one state to another. To compare this to information theory, consider the notion of information-as-knowledge and information-as-thing to be two states of information. Information-as-knowledge is the internal, abstract form of information. Information-as-thing is the external, concrete representation of information. Information-as-process is the means by which information is transferred from one state to the other.

Vreeken (2002) concludes that "information-as-thing and information-as-process are basic notions of information." Latham (2012) describes Michael Buckland's information typology as "insightful and useful for a broad understanding of what all cultural institutions have in common." According to Latham (2012),

> Starting with the "thing" we will assume it is already out there in the world and not be concerned yet from where it came. The person who perceives the "thing" goes through a process (a thought, comparison, fitting) from the "thing" and what it represented in the mind of the individual who processes it as a unique person ... Once this person has gone through this cycle, s/he may begin it over again by expressing his/her knowledge, creating a "thing"—a representation … This "thing" is only a representation, not in itself knowledge, which Buckland indicates can only be in the mind of an individual (Buckland, 1991a-b). In this sense, systems cannot be knowledge, only representations of knowledge. Therefore, representations of knowledge and events must be information-as-thing, whether in a library, a museum or with computer-based systems.

This process is illustrated in Figure 1.

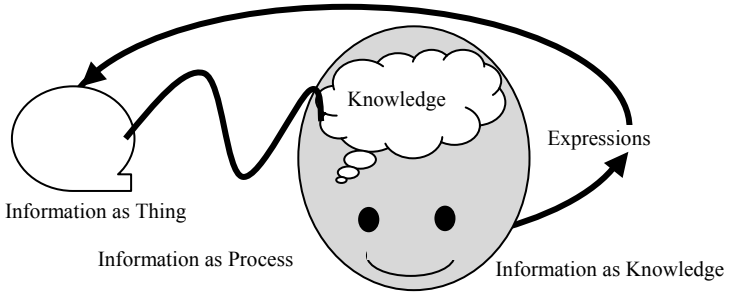

Figure 1: A visual interpretation of Buckland's three uses of the term "information." Source (Latham, 2012) (modified).

Lai Ma (Ma, 2010) illustrates Buckland's three forms of information as follows:

> Consider the example of a lecture in a university classroom. On the one hand, the lecture can be seen as "information-as-process," in the sense that it is intended to be an informing activity… However, this "information-as-process" cannot be handled and operated upon—stored and retrieved—by an information system … if it is not recorded and in a physical form such as lecture notes, sound recordings, or other materials. On the other hand, the anticipated result of the lecture is that students will become informed and more knowledgeable, that is, information in the sense of "information-as-knowledge." Like "information-as-process," "information-as-knowledge" cannot be handled by information systems because it can only be learned and evaluated by individual students. Hence, "information" in information systems has to be understood as being "information-as-thing."

Also, instead of asking what information *is*, Lai Ma (2010) conceptualizes information as something "having causal powers for altering human minds, 'knowledge structures,' or the general well-being of social beings." According to Lai Ma, this view resembles the notion of information in the Data-Information-Knowledge-Wisdom hierarchy, depicting "information" as an effect of data and as a cause of knowledge (and wisdom).

Furthermore, according to Latham (2012),

> Arguments against Buckland's information-as-thing claim that the constructive process of the human is left out, leaving us with a "blob of stuff" without meaning in it or perhaps insinuating that the object itself has embedded truths in it. But, Buckland very specifically says this is not so. He too (although not in great detail) sees the information "landscape" as a semiotic scenario, with the "object" (document) being only an ingredient in the full recipe that results in meaning to a person … *The lack of discussion about individual psychology, user experience, and affective relations is a major limitation to his conjectures*. [Italics added]

We claim that the proposed framework is characterized by generality lacking sufficient precision to serve as a foundation for information studies, including *psychology, user experience, and affective relations*. This paper revisits the notion of information-as-thing and presents a new approach to conceptualizing information schemes. The approach is based on the notion of "things that flow" ("flowthings"), e.g., information, data, and signals, and centers on an important characteristic of these things: liquidity (the state of being liquid). A flowthing flows in its flowsystem and triggers flowsystems of other flowthings. Accordingly, mental information triggers the flow of physical representations (signs) that flow to others' flowsystems. These concepts are applied to the known semiotic triangle.

Review of the Concept of Information

In this paper, we introduce the notion of information-as-things-that-flow. "Things that flow" are characterized by *liquidity*, the state of being liquid. This notion and relating of information to flow appears in many works. According to Langlois' (1983) "oil-flow" model of information,

> Information is some sort of undifferentiated fluid that will course through the computers and telecommunications devices of the coming age much as oil now flows through a network of pipes; and the measure of our knowledge in this world will be the amount of "info-fluid" we have managed to store up.

Hegland's (2011) *liquid information* concept is presented as follows:

> Information cannot exist without being connected to other information, and information increases the more information it is connected to increases, therefore it has the same natural tendency to connect with other information as water has to flow downhill.

The notion of flow is a widely used concept in many fields of study; for example, in economics, the goods circular flow model is well known, and in management science there is the supply chain flow. In computer science, the classical model of flow is the 1949 Shannon-Weaver communication model of electrical signal transfer from sender to receiver. This model reflects the concept of "flow" in terms of three stages: information being transmitted, information in the channel, and information being received. Flow of information means movement from one information sphere (that of the sender) to another information sphere.

We notice that "flow" often plays a secondary role and has not been explicitly singled out as a fundamental concept in many system descriptions. Many flow mechanisms exist: flowcharts, work flow, data flow, cash circular flow, flow diagrams, process flow diagrams. In ordinary programming flowcharts, flow occupies a secondary role with respect to control that has been extensively analyzed. In UML, the "flow" is qualified by "control and data." "Control flow" or "flow of control" is typically described as the order in which statements (of an imperative program), processes, operations, etc. are executed—but does "control" flow?

Not very much has been written about the concept of flow as such, and in the sense discussed in this paper. According to Casni (2005),

> The word flow sprang up as the word *fluxus* in Latin, long before many of us can remember. Its root definition has remained intact, with the primary meaning "to move in a (steady) stream". The cognitive image of a liquid is therefore fused into every metaphor using flow.

Casni (2005) distinguishes between *things that flow* and their "*riverbeds*":

> The sidewalks and aisles are the customer's equivalent to a river of asphalt—or dare I imply *riverbed* of asphalt. Because of their decidedly stationary and laterally limiting quality, these forms of indoor and outdoor flooring could not be the *liquid centre* of the metaphor *flow*, but are rather a channel for which something else of liquid quality will travel. [Underlines added]

Systems of Things that Flow

The notion of *flow* was first propounded by Heraclitus, a pre-Socratic Greek philosopher who declared that "everything flows." Plato explained this as, "Everything changes and nothing remains still," where instead of "flow" he used the word "change" (Stanford Encyclopedia of Philosophy, 2011). Flow can also be viewed along the line of "process philosophy" that "has been

championed most explicitly by Alfred N. Whitehead in his 'philosophy of organism,' worked out during the early decades of the 20th century" (Stanford Encyclopedia of Philosophy, 2011).

Heraclitus of Ephesus (535–475 BCE) was a native of Ephesus, Ionia (near modern Kuşadası, Turkey). He compared existing things to the flow of a river, including the observation that you could not step twice into the same river.

Flows can be conceptualized as transformation (e.g., inputs transform into outputs).

> Anybody having encountered the construction process will know that there is a plethora of flows feeding the process. Some flows are easily identified, such as materials flow, whilst others are less obvious, such as tool availability. Some are material while others are non-material, such as flows of information, directives, approvals and the weather. But all are mandatory for the identification and modelling of a sound process. (Henrich et al., 2014)

In this section we describe in general the flowthing model (FM) that has been used in many applications (Al-Fedaghi, 2008, 2010, 2011, 2013a, 2013b, 2014). Flowthing systems, in the FM model, are systems that transfer and/or create things. Transferred or created things can be released, processed, accepted, and arrived, as shown in Figure 2. (Where appropriate, we can refer to the combined stages of Arrive and Accept as Receive.)

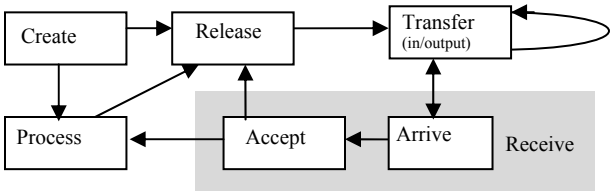

Figure 2: Flowsystem.

A flowthing in these systems can exist in one of only six states at a time: being *created*, *released*, *transferred*, *arrived*, *accepted*, or *processed*, with transformations occurring among these states. When information, as a flowthing, changes from one state to another, it has undergone a change of stage. Thus, we have six stages: creation, release, transfer, arrival, acceptance, and processing, as shown in Figure 2, where it is assumed that arriving flowthings are accepted (e.g., not rejected because of defect), and released flowthings are transferred (e.g., the channel is not broken down). The environment of flow is called its *sphere*, e.g., the (mental) information flowsystem of a person (sphere), the data flowsystem of a company (sphere), etc.

The stages of a flowsystem are mutually exclusive and complete; that is, a flowthing always exists in one of these states or stages. Process in this model is any operation on data that does not produce new data. Creation denotes the appearance of a new flowthing in the flowsystem (e.g., *if a person is >60 AND diabetic*, then *He is at risk*, where *He is at risk* is new information that has not come from outside but is created internally).

There are many types of flowthings, including data, information, money, food, fuel, electrical current, and so forth. In reviewing FM, we will assume that the flowthing is information. The life cycle of information is a sequence of states through which information moves, as follows:

1. Information arrives (i.e., it arrives at a new sphere, like passengers arriving at an airport).
2. Information is accepted (enters the sphere's information flowsystem).
3. Information is processed (i.e., it is transformed in some way, e.g., compressed, translated), without producing new information.

4. Information is released (i.e., it is designated as released information, ready to move outside the current sphere, like passengers whose processing is finished, e.g., luggage and passports checked, ready to depart from an airport).
5. Information is transferred to another sphere.
6. Information is created (i.e., it is generated as a new piece of information using different methods such as data mining, or human creativity).

Other states of information, e.g., stored or saved, are secondary states; thus, we can have created saved information, processed saved information, and so forth.

Sometimes it is difficult to see the existence of a stage in this model, for example, where information is transferred immediately after being created. In this case, the *decision* to release information coincides with creating information; thus the two stages wholly or partially merge. Nevertheless, it is possible that at the moment of executing the transfer there is a new decision to withhold it; thus we have the case of a distinct release stage that is different from the creation stage.

In addition to flows denoted as arrows, FM includes triggering mechanisms represented by dashed arrows. Triggering denotes activation, such as starting a new flow, and this will be illustrated in the following example. In general, for simplicity's sake, in this paper we will assume that all arriving flowthings are accepted. Hence, as noted, the *arrival* and *acceptance* stages can be merged as the *receiving* stage.

Example: Reconsider Lai Ma's (2010) example illustrating Buckland's three forms of information in a university classroom lecture in terms of information-as-process, information-as-thing, and information-as-knowledge. Before beginning a discussion of the example, it is necessary to mention the common view of the relationship between information and knowledge. It is suggested that information is a prerequisite of knowledge, or that information creates knowledge (Clark, 1997; Knox, 2007). Davenport (1997, cited by Knox, 2007) considers knowledge to be "valuable information from the human mind, includes reflection, synthesis, context that is hard to structure, difficult to capture on machines, often tacit [and] hard to transfer." Consequently, without further discussion of the differences between the two notions, we assume they are different types of flowthings.

The FM-based conceptualization can now be drawn in terms of three spheres: Lecturer, Student, and Reality, as shown in Figure 3. In the figure, it is assumed that the representation reflects information plus knowledge. For example, information in the lecture notes includes facts about the universe such as names of galaxies, planets, and stars, and "knowledge" such as "There is life elsewhere in the universe," which is not a fact, but a personal conclusion of the lecturer. Accordingly, both information and knowledge possessed by the lecturer contribute to (trigger) creation of the Representation in the figure; also, both are either stored or created. For example, information comprises either previously acquired information or information deduced from this acquired information.

The lecturer's information and/or knowledge, stored and/or created, triggers a mental *representation* (e.g., physiological signal) flowsystem that flows to reality (materializes) as some type of representation (e.g., signals/signs). The physical representation (in the form of written notes) flows to the student's mental representation system, triggering creation of information or knowledge. (Here we use the neutral term *representation* instead of sign or signal, for reasons we will discuss later.) It is assumed that both the lecturer's information and his or her knowledge arrive at the student's sphere as information.

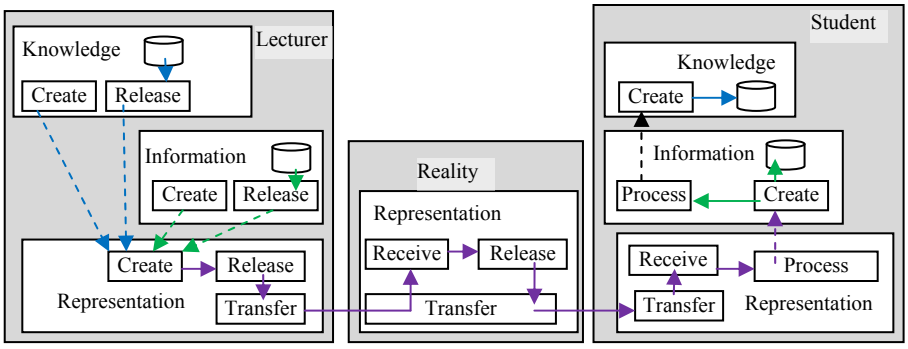

Figure 3: Information flow from Lecturer to Student.

This method of conceptualization provides a coherent conceptual picture that reminds one of technical drawings (e.g., electrical circuits). Information-as-thing apparently is reflected by the representation flowsystem in reality. Information-as-knowledge seems to refer to triggering the creation of knowledge by information (in the student's sphere). Information-as-process seems to refer to the indirect "transfer of information" from lecturer to student. The three notions seem fragmented and incomplete. For every type of sphere (e.g., physical sphere), the FM method also provides a generic method of categorization into processed information, created information, released information, and received information.

We further inspect how the FM model can influence the conceptualization of information-related notions.

Data Events and Documents

Data are also information-as-thing (Buckland, 1991a, 1991b). Buckland (1991b) uses another term, *object*, exemplified by dinosaur bones that give information about these animals. "Objects are collected, stored, retrieved, and examined as information, as a basis for becoming informed" (Buckland, 1991b).

Reflecting on the knowledge and information flowsystems in humans as modeled in Figure 3, we notice they are flowsystems with no transfer stage. Certainly knowledge in the human mind arrives and is accepted, processed, created, and released, but it is not transferred directly, as shown in Figure 4. Accordingly, in the mind of a human, the only way to transfer information is through creating its representation (signs/signals) and transferring the results to flowsystems of other human beings.

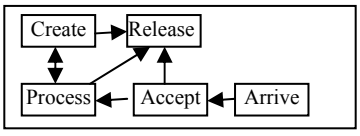

Figure 4: Flowsystem without Transfer stage.

Data are typically described as "raw information" or "things that have been given" (Buckland, 1991b). In FM, a batch of data is a thing that has a flowsystem with only the Creation stage. Figure 5 illustrates this conceptualization, where data about a tree trunk (e.g., the age of the tree) are created without the availability of a mechanism (release and transfer) to communicate such

data (no intentional communication). But whenever the trunk is cut, the data trigger signals (representations) that can be transferred to a system that turns them into information.

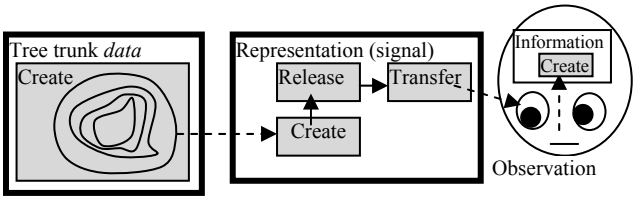

Figure 5: Data as a flowsystem with Create stage.

Similarly, for Buckland (1991b), *events* are a type of information-as-thing, for example, stock market activities, in flowsystems that only create data. A representation/signal system (see Figure 5) brings these activities to a flowsystem that converts them to information and knowledge. Buckland (1991a, 1991b) also uses the term *Document* to mean "anything" that is regarded as signifying something, including books, records, data, speech, signs, and symbolic objects. According to Latham (2012), Buckland heavily influenced Suzanne Briet (2006),

> Who asserted that a "document" is "any concrete or symbolic indexical sign [indices], preserved or recorded toward the ends of representing, of reconstituting, or of proving a physical or intellectual phenomenon" … To her, a wild antelope running on the savanna in its natural environment was *not* a document. But a captured antelope, taken to a zoo as an object of study, *was* indeed a *document*.

In the FM conceptualization, a wild antelope and its activities make up a flowsystem that creates data, as in the case of the tree trunk. With the presence of a signal/sign system and observation (a zoo as an object of study), it is a *source of information* that transfers data to an information flowsystem that creates information.

Application

Recent developments in the field of the Semantic Web utilize concepts in the area of linguistics and semiotics to represent, organize, and discover knowledge in the form of ontologies. In computing ontology and machine-processed semantics, "signs and symbols" play an important role in explanations of human understanding generally as well as on the Web, where concepts are mapped to ontological entities. Semiotics as the study of signs and symbols is relevant here, with notions such as interpretants, "value of a sign," reference, connotation, denotation, and so forth imported to provide a theoretical foundation for the approach. This venture also involves real-world ontology that includes ontological entities to construct a grand computing ontology with its underlying laws, rules, patterns, constraints, principles, etc.

In the Semantic Web, the technological focus is largely on content and representations that evolve into what is called the *Semiotic Web*. According to Sowa (2000), "The Internet is a giant semiotic system." The recent development of applying semiotics to the Web will lead to further development in refining conceptual semiotic notions. According to Sowa (2000),

> Current proposals for ontologies and metadata have overlooked some of the most important features of signs. A sign has three aspects: it is (1) an *entity* that represents (2) another *entity* [and] (3) an *agent*. By looking only at the signs themselves, some metadata proposals have lost sight of the entities they represent and the agents which interpret them.

The *Semiotic Triangle* is probably one of the most widely utilized concepts in this field. It is a conceptual definition of the *sign* that envisions it as a triadic unity. As an application of the FM-based conceptualization, we propose incorporating it into the *semiotic triangle* as a multi-component structure that connects the flow of ontologically different types. Our analysis involves describing an anatomy of the triangle and proposing a new model that accommodates currently acceptable semiotic accounts of it.

Ferdinand de Saussure's model (Saussure, 1916) defines a *sign* as the whole that results from the association of the *signifie*r (the form taken by the sign) with the signified (the concept it represents). A signifier such as the word STOP on a road sign triggers the signified concept that the car should halt. Saussure saw both the signifier and the signified as non-material psychological forms (Saussure, 1916, pp. 14-15, 66).

For Charles Peirce (1931-1958) (see Figure 6),

> A sign … is something which stands to somebody for something in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the *interpretant* of the first sign. The sign stands for something, its *object*. It stands for that object, not in all respects, but in reference to a sort of idea... (Peirce, 1931-1958, p. 228).

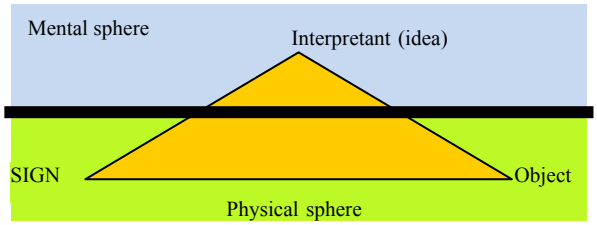

Figure 6: The semiotic triangle.

The sign is conceptualized as the semiotic triangle depicting a relationship between three entities: Object, Representation, and Interpretant. The relation between the Representation and Object is a causal relation that can exist only as mediated by the Interpretant. In a communication scenario, the triangle description can be phrased as a message from a sender to a receiver, as follows:

1. A thing (e.g., entity, event, etc.) *evokes* the sender's thought. In FM, data trigger a representation system that creates, releases, and transfers data.
2. The person refers to a *Representation* (a symbol such as the spoken or written word). In FM, this involves the arrival of a flowthing to a person.
3. The symbol evokes the recipient's thought. In FM, this amounts to creation of information and knowledge.
4. The receiver refers the symbol back to the thing. In FM, the reference here is a reference to the source of data.

A chain of signs can be depicted such that the Interpretant becomes the representation of the second sign, and the representation becomes the object and so forth.

Ogden and Richards (1923) criticized Saussure for "neglecting entirely the things for which signs stand" (p. 8) and adopted a version of the semiotic triangle as a model for linguistic signs in terms of thought (sense), symbol (representation), and referent (object).

From the definition of signs, researchers have developed the known classification of signs as: symbolic (the representation does not resemble the object), iconic (the representation resembles the object), and indexical (the signifier is connected in some way) to the signified, e.g., natural signs.

Signs as Things that Flow and Preserve Their Forms

Things that flow are transferable, creatable, and "processable" elements. We are interested in signs of this type because these signs bridge spheres of information (in typical jargon, carry information). They are movable signs that can be created, processed, received, released, and transferred. These signs cover most communicative signs, especially linguistic signs. In linguistics, the "signs that flow" reflect what is called "displacement" as a feature of the human language. One can refer to things that are not present, things of the past, and things of the future.

The semiotic triangle crosses two ontologically different types of spheres: the physical sphere and the mental sphere. In the semiotic triangle (Figure 6), and according to Peirce, the sign is not a physical thing, rather it is the ternary among the Object (physical), SIGN (physical representation), and Interpretant (mental) (Ogden & Richards, 1923; Peirce, 1931-1958;). For Peirce, a sign is the thing that carries information to a human mind in the order Object → SIGN → Interpretant. Accordingly, DNA is an object but not a sign because it does not carry information to the human mind.

From the FM perspective, the semiotic triangle seems too general to provide a foundation for the study of information. The things that form SIGNs, Objects, and Interpretant are ontologically different. So it is not clear how Object affects SIGN which in turn affects Interpretant. There is a need for the concept of flowsystems triggering each other. It is difficult to apply the triangle to the notions of "information-as-thing," "information-as-process," and "information-as-knowledge." According to Latham (2012), "information-as-thing" is the representation (SIGN), "information-as-process" is the Interpretant, and "information-as-knowledge" is the Object (meaning).

By contrast, the FM-based description provides an alternative depiction of the role of information in the general framework of information systems. We first introduce a brief picture of the FM-based depiction, shown in Figure 7. It includes four elements: Objects that are sources of data (e.g., tree trunk discussed previously) and Agents (e.g., human beings) that perform two functions in this context:

1. Perceiving data
2. Communicating with each other through representation.

Peirce's triangle can be conceptualized with four elements, as shown in Figure 7. This view of four ontological elements is an idea presented by Hjelmslev (1970, cited in Al-Fedaghi, 1999), as object, token/instance/occurrence, mental picture, and form/type. In language studies, it is said that an *expression* refers to a *form* that causes a *mental picture* that points to the *actual object*.

In Figure 7 objects as sources of data, as discussed previously, trigger agents to create representations (SIGNs) that can be exchanged with others. The physical representation triggers the creation of mental representation that, in turn, triggers the creation of information. Information in the mental sphere triggers creation of physical representation that can be transferred to others. The whole process is detailed in Figure 8, where it is sufficient to declare two agents explicitly to illustrate the act of communication that involves exchanging representations (SIGNs). The source of data is a flowsystem that creates data (e.g., tree trunk that exhibits tree age). Circled numbers in the figure will be used to explain different flows.

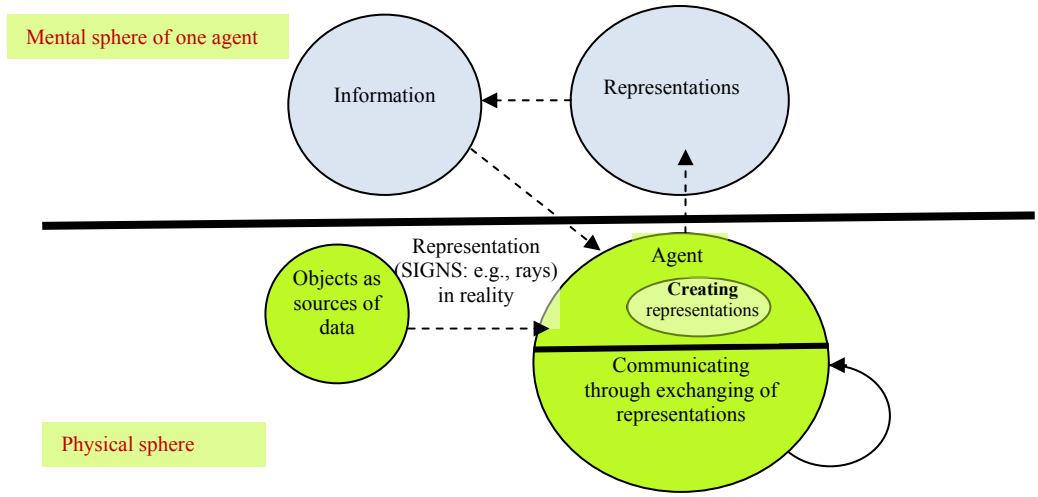

Figure 7: General view of objects, information, and representation.

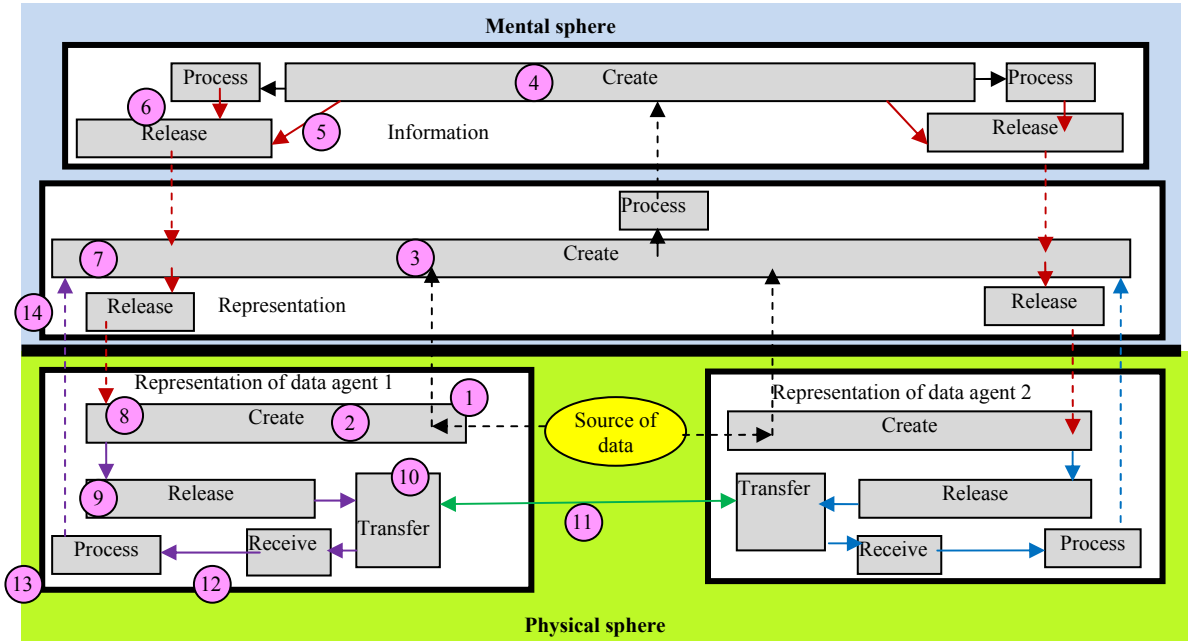

Figure 8. Flow of information and representation.

First, data (e.g., circle 1: waves of sound, rays of vision, etc.) reach Agent 1 and cause creation of a representation (e.g., circle 2: writing). We ignore here, without loss of generality, direct perception (e.g., vision to perceive) because we focus on the notion of information-as-thing. Creation of a (physical) representation triggers the creation of a mental representation (3) that is processed to trigger the creation of information (4).

Communicating this information to others requires a decision to release it (5). It is possible that the information is processed first, before the decision to release it is made (6). In either case, releasing information means triggering the creation of a mental representation (7) and a decision to release it by creating a physical representation (8). Hence, Agent 1 can now release (9) and transfer the physical representation to Agent 2 (10). The same thing can be performed by Agent 2;

therefore, we have a bi-directional arrow between the two agents (11). When Agent 1 receives a physical representation from Agent 2 (12), it is processed (13) to trigger creation of a mental representation (14).

Consider *concepts*, a notion touching many areas, as a flowthing. Concepts can be born (created) or imported from outside. Regardless of their origins, they can be processed and stored in their mental flowsystems. Communicating them requires triggering the creation of mental signs that are realized by physical signs. The physical sign is transmitted to the destination agent, triggering the creation of the corresponding idea in the agent's mental sphere. Note that there is no attempt here to propose a "new theory of cognition"; rather, we demonstrate that however a mental sphere is conceptualized, FM provides an abstract representation system analogous to, say, graphs that may depict cities and connections among them or elements in data structures and their relationships. FM is a systematic tool used to map the involved flows resulting from such a conceptualization. An important feature of FM is its requirement of "recognizing separately flowthings and their flows" when describing systems. In the previous example, FM schematization explicitly reflects that concepts cannot flow directly to other agents as in the case of, say, physical acts (e.g., kicking), where a physical kick is created (e.g., muscles are activated), released (it is possible to cancel it abruptly), and transferred directly to its target.

Conclusion

This paper has analyzed categorization of information as Information-as-process, Information-as-knowledge, and Information-as-thing, a concept that has received a great deal of interest over the last ten years. This analysis starts by revisiting the notion of "information" in general and then presents a new approach to conceptualizing of information schemes. The approach is based on the notion of "things that flow" ("flowthings") and the feature of liquidity (flowing). Accordingly, mental information triggers the flow of physical representations (signs) that flow to others' flowsystems. These concepts are applied to the known semiotic triangle. The resultant conceptual picture clarifies the sequence of ontological spaces and their relationships that are associated with the concept of information. We propose to incorporate this model into current research in the nature of information and knowledge.

Further work in this area would study the flowsystem in the context of the theory of signs and related fields.

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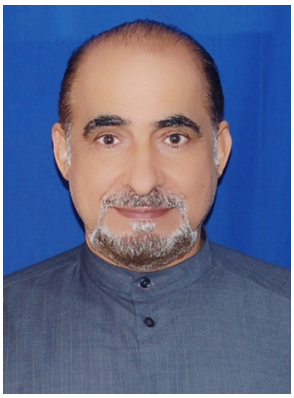
Biography



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