

ORGANIZATIONAL KNOWLEDGE DYNAMICS: A METAPHORICAL ANALYSIS

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Abstract. *The purpose of this paper is to do a metaphorical analysis of the concept of “knowledge dynamics” in an organizational context. Cognitive sciences demonstrate that our mind is primarily a metaphorical mind, and we advance from known to unknown by using metaphors. Abstract concepts are largely metaphorical and our thoughts are mostly unconscious. That means that understanding the concepts of “knowledge”, “dynamics”, and “knowledge dynamics” is dependent on the metaphors used for mapping the meanings from the source domain into the target domain. The first generation of metaphors used for “knowledge” put into their source domain physical objects and created the meaning of “stock”, and the concept of “dynamics” means motion in space. In the second generation of metaphors, the source domain contained a fluid, and its main characteristic of flowing in space under a field of forces. Thus, the new meaning of knowledge is that of “flow”. In a generic way, the metaphor changes the meaning of “stock” into “stock and flow”. “Knowledge dynamics” is represented now by “knowledge flow” which means that we are under the Newtonian logic. In the third generation of metaphors, the source domain contains the semantic spectrum of “energy”. Energy manifests as a non-substance field. Energy exists in many forms, like: mechanical energy, thermal energy, electrical energy, solar energy, nuclear energy, or gravitational energy. Energy can transform from one form into another form. In this situation “dynamics” means “transformation”, like in thermodynamics. “Knowledge dynamics” means now a transformation of a form of knowledge into another one, which allows our mind to interpret much better the semantic spectrum of the concept of “knowledge”.*

Keywords: *emotional knowledge; knowledge dynamics; knowledge field; knowledge metaphors; rational knowledge; spiritual knowledge.*

Introduction

Lakoff and Johnson (1999, p.3) consider that “The mind is inherently embodied. Thought is mostly unconscious. Abstract concepts are largely metaphorical.” That means that we learn new things and go from known to unknown based mostly on our metaphorical mind. Conceptual metaphors help us to understand a less known thing in terms of another, known thing. According to Lakoff and Johnson (1999, p.7), “The fact that abstract thought is mostly metaphorical means that answers to philosophical questions have always been, and always will be, mostly metaphorical. In itself, that is neither good nor bad. It is simply a fact about the capacities of the human mind.” The difficulty of understanding the metaphorical work of our mind comes from the fact that most of the work is done by the cognitive unconscious, which is a realm where thoughts cannot be seen by our conscious radar and logical introspection. Our perception and motor system perform their tasks without almost any contribution from the rational brain and we are not aware how all these facts do happen. “All of our knowledge and beliefs are framed in terms of a conceptual system that resides mostly in the cognitive unconscious” (Lakoff & Johnson, p.13). Thus, metaphors guide our perception and fuel our imagination. They constitute the bridge between the real world we are living in and our mental world. They help us to interpret and understand the realms of human experience (Bolisani & Oltramari, 2012; Cornelissen et al., 2008; Moser, 2000, 2004; Steen, 2011).

While a linguistic metaphor is a figure of speech used especially by writers, a conceptual metaphor deals with our semantic framework. As Pinker (2008, p.241) remarks, “Conceptual metaphors point to an obvious way in which people could learn to reason about new, abstract concepts. They would notice, or have pointed out to them, a parallel between a physical realm they already understand and a conceptual realm they don’t understand yet.” Andriessen (2006, 2008, 2011) applied these ideas coming from the cognitive sciences and analyzed the most significant knowledge metaphors and their

pattern embedded in a cultural context. He demonstrates that *knowledge* has no referent in the physical world and from this point of view the semantic field associated to knowledge is open to different interpretations coming from the metaphors people use. That means that someone's understanding of the *knowledge* concept is limited by the metaphor used to conceptualize it. As Andriessen and Boom (2007, p.3) show, "Knowledge is not a concept that has a clearly delineated structure. Whatever structure it has it gets through metaphor. Different people from different culture use different metaphors to conceptualize knowledge. They may be using the same word; however, this word can refer to totally different understandings of the concept of knowledge."

The purpose of this paper is to show how different metaphors shape our understanding concerning the concepts of "knowledge", "dynamics", and "knowledge dynamics". In the next section I shall present the first and second generations of metaphors used for these concepts. In the third part of the paper I shall present the energy metaphor, the metaphor able to go beyond the Newtonian logic and to describe "knowledge dynamics" using the principles of thermodynamics.

Knowledge as objects

The first generation of metaphors is characterized by the fact that the source domain contains a physical object and its attributes. Thus, the metaphor maps some of these attributes and the actions the object may have as a result of the interaction with a field of forces. The next examples taken from literature illustrate how physical attributes of different objects are associated with the concept of *knowledge*. For ease of identification I shall use italics for these attributes.

"Codification can be defined as a process of *storage*, *indexation* and *distribution* of formal knowledge independently of any context" (Janicot & Mignon, 2012, p.6).

"If we understand how we *build* knowledge, than we must understand our own purpose" (Allee, 1997, p.16).

"Just as food and manufactured goods can be packaged and sold, there are many ways to *package* knowledge for commercial benefits, using the intellectual property laws" (Sullivan, 1998, p.143).

Andriessen (2008, pp.11-12) made a content analysis of many books and papers published in the field of knowledge management and identified many verbs describing actions with objects that are currently used to describe knowledge processing: accumulate knowledge, categorize knowledge, deliver knowledge, exchange knowledge, locate knowledge, measure knowledge, move knowledge, package knowledge, sell knowledge, sort knowledge, store knowledge, etc. Even if these metaphors have been useful in making us understand what *knowledge* is, we have to recognize the limitations imposed by the physical attributes to the concept of *knowledge*. The most significant limitations are the Newtonian logic and reversible motion. Newtonian logic means to use linearity and summation, although knowledge is nonlinear and cannot be added-up like objects. The reversible motion is used for reversible processes, in which *time* has only a quantitative dimension and no entropic orientation. That means that *knowledge dynamics* is considered as a simple motion in space like for any physical object.

Knowledge as an iceberg

A special attention has been given to the *iceberg* metaphor. The iceberg metaphor is simple and very intuitive, especially for illustrating the two types of knowledge: explicit knowledge and tacit knowledge. The tacit dimension of knowledge has been introduced by Polanyi (1983) who considers that we acquire knowledge through direct experience of our body and senses. "I shall reconsider human knowledge by starting from the fact that we can know more than we can tell" (Polanyi, 1983, p.4). For instance, we can recognize the face of a known person from many others, but we cannot describe how we do or what kind of knowledge we use. That means that we have some previous knowledge acquired but it is stored in the unconscious zone of our brain. According to Nonaka and

Takeuchi (1995, p.8), “Tacit knowledge is highly personal and hard to formalize, making it difficult to communicate or to share with others. Subjective insights, intuitions, and hunches fall into this category of knowledge. Furthermore, tacit knowledge is deeply rooted in an individual’s action and experience, as well as in the ideals, values, or emotions he or she embraces.”

Explicit knowledge is that we can express in a given language and communicate since it is a result of the conscious processes. Tacit knowledge is that we cannot express using the natural language since it resides mostly in the cognitive unconscious. Metaphorically, the visible part of the iceberg is associated with explicit knowledge and the invisible part – that part of the iceberg that is under water – is associated with tacit knowledge. The dyad composed of *explicit knowledge* and *tacit knowledge* became the most used in the literature due to the large impact of the works published by Nonaka and his colleagues (Nonaka, 1991, 1994; Nonaka & Takeuchi, 1995; Nonaka, Toyama & Hirata, 2008). The iceberg metaphor is much more powerful than the simple metaphors based on objects since it allows understanding the hidden part of our knowledge, the tacit knowledge. However, being a physical object the iceberg introduces the same type of limits as discussed above.

Knowledge as flows

This is an advanced metaphor since it considers a source domain based on *a fluid*, which is a continuous domain. The main attribute of the fluid that is mapped onto the target domain is *flow*. Thus, the model of *stocks* for knowledge is substituted with the model of *stocks-and-flow*. To illustrate this new perspective I shall present some examples from the literature.

“Knowledge is *a fluid* mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information” (Davenport & Prusak, 2000, p.5).

“Rapid and reliable *flows of knowledge* across people, organizations, times, and places are critical to enterprise performance. Unfortunately, the leader and manager have negligible current guidance for assessing and enhancing *knowledge flows* in practice” (Nissen, 2006, p.IX).

“With the wider view I am taking, I claim that managing *knowledge flows* is something that can be applied and used in almost any type of organization” (Leistner, 2010, p.6).

In the metaphorical interpretation of knowledge as *stocks-and-flows*, *stocks* refer to the amount or level of knowledge existing at a given time in a given place, and *flow* of knowledge as the knowledge transfer from one place of the organization to another place. Bolisani and Oltramari (2012, p.282) show that “In a *stock-and-flow* model of knowledge, it is assumed that knowledge is exchanged between economic players and, in this way, economic value is also exchanged.” The metaphor of stocks-and-flows enlarge the understanding horizon of knowledge creation and processing (Leistner, 2010; Nissen, 2006; Nonaka, Toyama & Hirata, 2008) but it remains within the limits of the Newtonian logic. Knowledge dynamics results from the flow of knowledge which is essentially a Newtonian motion generated by the gravity forces. Even so, many scholars using this metaphor do not offer any explanation of the field of forces that generates flow of knowledge.

Knowledge as energy

It is our experience and inspiration in choosing the metaphor in dealing with knowledge. The point is to be aware of the limitations of that metaphor since otherwise we may make wrong decisions. For instance, using a metaphor based on Newtonian logic we may consider that knowledge can be accumulated as physical objects accumulate in a linear process. But knowledge is nonlinear and we cannot add up different entities of knowledge to get as output their sum. It is like saying that adding up two books of management leads to a double quantity of knowledge, which is a wrong conclusion. The

two books may have a lot of overlapping such that the total quantity of knowledge to be just a little bit more than only one book.

There is only one way to advance with knowledge conceptualization: to create new metaphors able to enlarge our horizon of understanding. Edvinsson (2002, p.106) emphasizes very well the same idea when talking about what we need now: “New metaphors, new models, new organizations.” I was thinking of such new metaphors during a *Knowledge Café* event moderated by David Gurteen at the *European Conference on Knowledge Management* hosted by Universitat Politecnica de Catalunya, 6-7 September 2007, in Barcelona, Spain. My engineering background inspired me to think about thermodynamics and energy as a possible new metaphors for knowledge. I discussed then this new approach with Daniel Andriessen, known for his pioneering work on knowledge metaphors, and we presented then the first ideas at the next *European Conference on Knowledge Management* hosted by the Southampton Solent University, 4-5 September 2008, Southampton, UK. Then I developed new energy metaphors and explained how knowledge dynamics can get new interpretations based on the thermodynamics phenomena and laws (Bratianu, 2009, 2011, 2013; Bratianu & Andriessen, 2008; Bratianu & Orzea, 2013, 2014).

Knowledge as Energy is a metaphor composed of two semantic fields: the source domain contains the semantic field for *Energy*, and the target domain contains the semantic field for *Knowledge*. Energy is not a substance. It is a *field*. This is the main attribute which will be transferred to the target domain to knowledge. That means we can conceive knowledge as a *field*. It is already a step forward from considering knowledge as an object or a fluid since it is not anymore a corporal entity. To get a better grasp of that attribute let us consider the gravity field. We cannot see it. We cannot touch it. However, we can feel the consequences of being under the influence of the gravity field when we jump and become attracted by its powerful force. The same with knowledge: we cannot see it and we cannot touch it. But we feel the knowledge field through its consequences, as I shall explain in the following argumentation. The other fundamental attributes of energy we are going to transfer to the target domain are the following:

- Energy field is always non-uniform. Its non-uniformity generates forces and fluxes that transfer the energy from that part of the field which is at a higher level toward the part that is at a lower level of energy. Thus, the transfer does not manifest as a mechanical motion under the Newtonian laws, but as a flux of energy under thermodynamics laws.
- Energy manifests in different forms: mechanical energy, thermal energy, electrical energy, nuclear energy, etc.
- One form of energy can transform into another form of energy. For instance, a part of the mechanical energy used to produce a certain mechanical work is transforming into thermal energy, due to friction.
- Energy dynamics means transformation and not mechanical motion in space like in the Newtonian physics.

Attributes that cannot be transferred from the source domain toward the target domain are related to the fact that energy cannot be created and cannot be lost. Energy can only to transform from one form of existence into another form in concordance with the conservation laws.

Let us consider now the attribute of non-uniformity. For example, we may think of a thermal field. In such a field, non-uniformity generates a *heat flux* that transfers energy from the part with a higher temperature toward the part with a lower temperature. That means that any transfer of energy is due to a deficit of energy between two different points of the field. If there is the same temperature between two different points of a thermal field there will be no energy transfer. The heat flux is zero. Transferring this property in the target domain we can say that knowledge transfer is a flux of knowledge between two individuals or two groups of individuals due to a deficit of knowledge. That means that if two individuals know the Archimedes principle, there is no meaning for one individual to teach the other about that principle. It is important to understand this attribute of the knowledge field in order to create and use efficiently knowledge sharing and knowledge transfer processes. Also, it is important in creating knowledge maps which show the distribution of knowledge across a team or an organization. Unlike energy fluxes that results directly from the non-uniformity of energy fields,

knowledge fluxes are created as a result of any knowledge deficit but only by the decision of people. Knowledge transfer phenomena are not direct but mediated processes. Also, knowledge transfer may find many barriers of different nature, from psychological to structural ones.

One important type of knowledge transfer is knowledge sharing (Bratianu & Orzea, 2010; Jashapara, 2011; Nonaka & Takeuchi, 1995; O'Dell & Hubert, 2011). Knowledge sharing is stimulated by an internal motivation and supported by an adequate cultural context based on trust and willingness of helping others. "Knowledge sharing is a process that links the individual fields of knowledge to the team or organizational fields of knowledge along the ontological dimension, as shown by Nonaka & Takeuchi (1995)" (Bratianu, 2015). However, in any organization there are different barriers to develop knowledge sharing. Szulansky (1995, 1996, 2000) calls all these barriers in a generic way *knowledge stickiness*: "The assessment of the degree of difficulty experienced in a transfer is likely to reflect the number and intensity of those distinct moments of difficulty. Other things equal, a transfer is more likely to be perceived as difficult or sticky when efforts to resolve transfer problems become noteworthy" (Szulansky, 2000, p.11). Knowledge stickiness can be reduced dramatically within communities of practices, which are groups of people who share similar problems or topics and are willing to share their experience and expertise in a trusting social environment (Wenger, McDermott & Snyder, 2002).

The next fundamental attribute is that energy manifests in different forms: mechanical energy, thermal energy, electrical energy, nuclear energy, etc. That means that we can consider knowledge as manifesting in different forms as well. Based on cognitive science results I consider that for knowledge we can consider three fundamental fields: rational knowledge, emotional knowledge, and spiritual knowledge. These fields are interacting and generating new knowledge. *Rational knowledge* is the result of the rational processing of information coming to brain, and rational decision making by processing knowledge. Rational knowledge can be expressed using natural or symbolic languages and from this point of view we may consider it to be explicit knowledge. Many philosophers starting with Plato considered rational knowledge to be identical with the concept of knowledge. Plato focused on the work of mind and ignored consciously the work of senses. As Russell (1972, p.153), "It follows that we cannot know things through the senses alone, since through the senses alone we cannot know that things exist. Therefore knowledge consists in reflection, not in impression, and perception is not knowledge." Descartes made it clearly that only the conscious mind can generate knowledge, developing the Cartesian dualism between body and mind. His famous sentence *Cogito, ergo sum!* means that I think and therefore I exist. "What of thinking? I find here that thought is an attribute that belongs to me; it alone cannot be separated from me. I am, I exist, that is certain" (Descartes, 1997, p.141). Rational knowledge is objective and thus it can be used to find the truth. The whole education in Europe and then in US has been built up on rational knowledge and rational thinking. That is the knowledge we can exchange by using natural or symbolic languages.

If one search on internet the expression "emotional knowledge" chances are to find inputs for "emotional intelligence" since in the literature there is only explicit knowledge and tacit knowledge. The concept of *emotional knowledge* has been introduced by Bratianu (2008) and developed further by Bratianu and Orzea (2009, 2013). Emotional knowledge is hidden in the tacit knowledge cloud as emotions: "Highly subjective insights, intuitions, and hunches are an integral part of knowledge. Knowledge also embraces ideals, values, and emotion as well as images and symbols" (Nonaka & Takeuchi, 1995, p.9). Emotional knowledge is generated by emotions and feelings. Emotions represent a direct result of the interaction between our body and the environment, and they are processed by the cognitive unconscious. The result of such an interaction can be seen as a *neural map* on the brain. From such a neural map the brain generates a *mental map* that is a reflection of the body interaction (Damasio, 1999, 2003, 2012). The mental maps are called by Damasio (1999, p.26) *wordless knowledge*: "The simplest form in which the wordless knowledge emerges mentally is the feeling of knowing – the feeling of what happens when an organism is engaged with the processing of an object – and that only thereafter can interferences and interpretations begin to occur regarding the feeling of knowing." These wordless knowledge is the *emotional knowledge*.

Spiritual knowledge constitutes the third fundamental component of the triple helix of knowledge (Bratianu, 2013, 2015). It reflects our understanding about the meaning of our existence, and about our working life and environment. People go beyond the tangibility of objects and our bodies trying to get answers to existential questions, like: Who am I? Why am I here? What is my connection with the universe? As Maxwell (2007, p.274) remarks, “We have to learn to see aspects of the world around us: stones, people, trees, sky. Equally, we have to learn to see meaning and value in the world around us, in our environment, in events, in human actions and lives.” That field of knowledge containing possible answers to such questions and values for our decisions is a field of spiritual knowledge. In any process of decision making people use not only rational knowledge as we learned in schools but also emotional knowledge and spiritual knowledge. Our decisions are made in a given cultural framework and thus spiritual knowledge contributes essentially to the final choices we make. At the organizational level, spiritual knowledge is embedded in the Corporate Social responsibility (Bratianu, 2015; Mitroff & Denton, 1999; Zohar & Marshall, 2000, 2004).

The last important attribute transferred from the energy domain is related to the interactions between the different forms of energy and the capacity of one form of energy to transform into another form in concordance with thermodynamics laws. Thus, we postulate that one form of knowledge can transform into another form of knowledge, but without any conservation limitations like in thermodynamics. That means that *knowledge dynamics* means in this context *transformations* and not simple motions in space like in the Newtonian logic. This is a very important result of the energy metaphor since is changing completely the dynamics paradigm of knowledge used so far. The simplest energy transformation is that for mechanical energy from potential energy into kinetic energy. This transformation can be mapped onto the transformation from tacit knowledge into the explicit knowledge. Tacit knowledge plays the role of potential energy since it is the result of our life experience. Going further to other energy transformations we can go into thermodynamics and consider the transformation from mechanical energy into thermal energy and vice versa. The well-known phenomenon of friction can illustrate that transformation. Another transformation in the source domain is that of mechanical energy into electrical energy. The piezoelectric effect can be a good illustration of it. Transferring such a transformation into the target domain we can think of the rational knowledge transforming into spiritual knowledge, a transformation based on cultural values and wisdom. Finally, in the source domain we may have the transformation of the thermal energy into electrical energy and vice versa. The thermocouple phenomenon can illustrate very well that transformation. In the target domain we will have the transformation of emotional knowledge into spiritual knowledge and vice versa. The case of Buddhist monks who try through meditations to reach some spiritual states of their mind by reducing negative emotions can illustrate very well that transformation (Ricard, 2007).

Conclusions

We understand abstract concepts by using metaphorical thinking. That means to use a semantic domain of a concept we know very well in order to describe the semantic domain of a new concept. *Knowledge* and *knowledge dynamics* are new abstract concepts we don't know very well. Thus, we use different metaphors to describe these new concepts. As a consequence, the depth and limitations of our understanding depend on the semantic of the source domain. The first generation of metaphors used for the source domain objects with physical attributes. Generically we call these metaphors the *stocks* metaphor. The second generation of metaphors used for the source domain fluids and their flows as main characteristic. The *stocks-and-flows* metaphor offers new understanding concerning *knowledge dynamics* but it has the same limitations of the Newtonian logic as previous ones. The present paper introduces a new metaphor that is able to go beyond Newtonian logic and Nonakian dynamics: the *energy metaphor*. In the source domain we place *energy* with all its attributes and then we try to transfer those attribute that can fit the concept of *knowledge*. The most important attributes transferred to the knowledge domain are the following: energy is a field; energy manifests in different forms; one form of energy can transform into another form of energy in concordance with the laws of thermodynamics. Thus, we consider for knowledge three fundamental fields: *rational, emotional, and*

spiritual knowledge. Each form of knowledge can transform into another form of knowledge and *knowledge dynamics* means transformation and not just a simple motion in space.

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