L'analyse métaphorique portant sur le management de la connaissance. La connaissance en tant que champ

Constantin BRATIANU[1]

Résumé : Le but de cet article est de présenter une perspective nouvelle sur l'analyse métaphorique de la connaissance : la connaissance en tant que champ. Le concept de champ est issu de la physique, où il est défini comme un continuum immatériel des forces générées par un objet spécifique tangible. Cette perspective permet de surmonter les limites des interprétations antérieures de la connaissance comme chose ou flux, en particulier les limites de la substantialité et de linéarité. Dans cette perspective nouvelle la connaissance est conçue comme une entité non substantielle, non uniforme, non homogène et non linéaire. Par conséquent, nous tenterons d'ouvrir de nouvelles perspectives pour la compréhension de la connaissance et de sa dynamique organisationnelle.

Mots-clés : dynamique de la connaissance, connaissance tacite, connaissances explicite, connaissances émotionnelle, champ de la connaissance

***

A New Perspective on Knowledge Metaphorical Analysis: Knowledge as a Field

Abstract: The purpose of this paper is to present a new perspective on knowledge metaphorical analysis: knowledge as a field. The concept of field is taken from physics, where it is defined as an intangible continuum of forces generated by a specific tangible object. This perspective overcomes the limits of the previous interpretations of knowledge as stuff

[1] Professeur des universités docteur, Académie d'Etudes Economiques, Bucarest, Roumanie, cbratianu@yahoo.com

or flow, especially the limits of substantiality and linearity. In the new perspective knowledge is conceived as a nonsubstantial entity, nonuniform, nonhomogeneous and nonlinear. Thus, we open new opportunities for understanding knowledge and its organizational dynamics.

Keywords: knowledge, tacit knowledge, explicit knowledge, emotional knowledge, knowledge field, knowledge dynamics

***

Introduction

Knowledge plays a fundamental role in understanding the world we are living in. It is a primary fuel for the knowing process, and in the same time it is a result of this process contributing to the construction of our conceptual system. This system structures our perception of everyday realities and help us to relate to other people through thinking patterns or mental models (Bratianu, 2007; Gardner, 1993; Gardner, 2006; Senge, 1990; Sherwood, 2002; Simon, 1996). This conceptual system based on which we think and act is essentially metaphoric in nature. According to Lakoff and Johnson (2003, p.4) "*The essence of metaphor is understanding and experiencing one kind of thing in terms of another*". Thus a metaphor is much more than just a poetic construction based on imagination. "*The mind is inherently embodied. Thought is mostly unconscious. Abstract concepts are largely metaphorical. These are three major findings of cognitive science. More than two millennia of a priori philosophical speculation about these aspects of reason are over*" (Lakoff & Johnson, 1999, p.3).

Andriessen (Andriessen, 2006; 2008; Andriessen and Boom, 2007) has shown that the conceptualization of knowledge in knowledge management and intellectual capital literature is primarily based on metaphors. In the West, dominant metaphors of knowledge are based on the idea of knowledge as stuff. He concluded that to bring progress to the field we need to find more new non-stuff metaphors. In one of recent theoretical research Bratianu and Andriessen (2008) considered the *knowledge as energy* metaphor. In their analysis the source domain is represented by the concept of *energy*, and the target domain is represented by the concept of *knowledge*. The metaphorical semantic kernel is given by the intersection of the two semantic domains. The larger this semantic intersection, the better cognitive approximation we get by using this metaphor. At the same time, there will always be some characteristics of the source domain not used by metaphor, as well as some characteristics of the target domain not covered by the source domain (see figure 1).

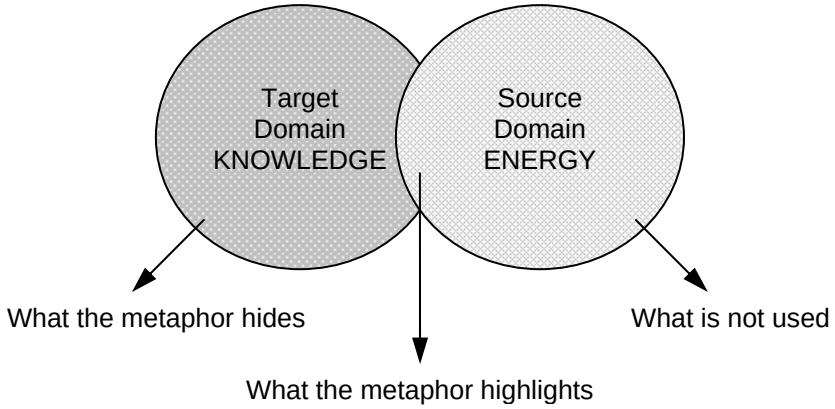

Figure 1: *The knowledge as energy metaphor*
(Source: Bratianu & Andriessen, 2008)

Knowledge is intangible. It is a non-substance entity and thus it can be considered as a *field*. Unlike energy, knowledge can be created and destroyed. Thus, we cannot conceive any conservation law for knowledge. As a consequence of this non-conservative nature *sharing knowledge* becomes an important process in management and organizational learning. Knowledge may have intensive and extensive dimensions, but they must be defined in a different way than in physics. Knowledge can be tacit and explicit. Tacit knowledge can be transformed into explicit knowledge and vice versa. In a different perspective, knowledge may be structured into cognitive knowledge and emotional knowledge (Bratianu, 2009; Hill, 2008).

Knowledge as a field

The most important characteristic resulted from the metaphorical analysis of knowledge as energy is the field nature of knowledge. Knowledge is not an object, not a fluid or its flow, but a field of forces. Such a field is by its nature mass free and spread in space as a continuous domain. However, this is a new perspective since most works so far considered knowledge as stuff or stocks and flows. For instance, Andriessen (2006, 2008), Andriessen and Boom (2007) showed in their analyses that the dominant view in the western thinking is the metaphor of knowledge as an *object* that can be created, stored, shared, located, moved, controlled and manipulated. This substantial perspective is still dominated in many books and papers on knowledge management and intellectual capital management. This view is aligned with the resource view of any organization, and thus it is just an extrapolation from tangibles to intangibles. On the other hand, in the eastern

works dedicated to knowledge and knowledge management, the metaphors used are those of *spirit* and *wisdom*. Both concepts have a spiritual nature which means actually a non-substance or field characteristic. To understand better what a field means, let us consider the gravity field. We are living every moment of our lives and everywhere on Earth in this gravity field, without a conscious representation of it in our minds. However, we feel it anytime we jump, or we want to take in our hands a heavy weight. In views of Nonaka and Takeuchi, "*Highly subjective insights, intuitions, and hunches are an integral part of knowledge. Knowledge also embraces ideals, values, and emotions as well as images and symbols. These soft and qualitative elements are crucial to an understanding of the Japanese view of knowledge*" (Nonaka and Takeuchi, 1995, p. 9).

Shifting from a static view to a dynamic view, Nissen promotes the conceptual construct of *flow*, by comparison with a fluid flow: "*All knowledge required for an organization to perform its work processes and to accomplish its mission needs to flow within such organization. Knowledge lies always on the critical path of work; that is, people must know how to accomplish a job before they can accomplish it. Hence, even routine knowledge necessary to perform ordinary work processes within an organization must flow across numerous dimensions* "(Nissen, 2006, p.7). Knowledge flow takes place between people. They may work together in the same team or department, or they may work in different organizational units of the same plant or of different plants. Knowledge flows along the formal structural directions but also along informal connexions. Knowledge flow may be considered also along time direction, from one day to another day, or from one generation to another generation of workers. Thus, knowledge flows may be interpreted in different space and time frameworks. However, in physics any flow is generated by a pressure field, and Nissen does not discuss how we can interpret this pressure in the organizational environment. The only pressure field we can thing of is the authority pressure, which is working top-down along the vertical direction; knowledge flows along this direction especially as orders toward middle management and executives.

Tacit knowledge as potential energy

Tacit knowledge is a fuzzy concept since we cannot define exactly what it is, and how we can measure it. Polanyi, who was among the first to investigate deeply this knowledge dimension stated: "*I shall reconsider human knowledge by starting from the fact we can know more than we can tell. This fact seems obvious enough; but it is not easy to say exactly what it means*" (Polanyi, 1983, p.4). Tacit knowledge "*is personal knowledge embedded in individual experience and involves intangible factors such as personal belief, perspective, and the value system*" (Nonaka and Takeuchi, 1995, p.VIII). Being highly personal, tacit knowledge is hard to be formalized and communicated or shared with others. Also, subjective

insights, intuitions, and hunches fall into this category. It is deeply rooted in an individual experience, which reflects actually its positioning with respect to a certain cultural environment, similar to the potential energy dependence to the body position with respect to the gravitational field. The magnitude of tacit knowledge can be increased by increasing one individual's experience. Explicit knowledge "*can be articulated in formal language, including grammatical statements, mathematical expressions, specifications, manuals and so forth. This kind of knowledge thus can be transmitted across individuals formally and easily*" (Nonaka and Takeuchi, 1995, p.VIII). Explicit knowledge is associated to the decision making process and to action. It is a dynamic form of knowledge which is able through its variation to generate decisions and actions in the way kinetic energy generates mechanical work as a result of its variation. Tacit knowledge can be transformed into explicit knowledge through the externalization process, and explicit knowledge can be transformed into tacit knowledge through the internalization process (Nonaka and Takeuchi, 1995; Nonaka and Konno, 1998). Tacit knowledge has many similarities with the *potential energy* from physics. This energy is generated by the gravity field and any tangible object has inherently a certain level of potential energy, which depends mainly on its position with respect to the earth surface. By comparison, we can say that tacit knowledge depends on the position of certain individual with respect to a field of meanings and feelings generated by social life.

Explicit knowledge as kinetic energy

Explicit knowledge represents that part of the individual knowledge that can be expressed using language. It is the knowledge people exchange in their everyday encounters, and the knowledge embodied in books and papers. Basically, it is the rational part of the knowledge field. It is the knowledge that puts in motion the decision making process and the organizational dynamics. Explicit knowledge is similar to the *kinetic energy*, which generates mechanical power. Kinetic energy can be obtained from potential energy, and it can be transformed into potential energy. In physics the conservation law states that potential energy and kinetic energy can transform one into another, such that the total energy to remains constant. Energy cannot be created and cannot be destroyed. For any given system the total energy remains constant. Making a parallel between the energy field and the knowledge field, we have to stress the fact that there is no conservation law for knowledge. For any given knowledge system we can write the relation:

$$K = TK + EK \qquad (1)$$

where K is the total knowledge of the system, TK is the tacit knowledge, and EK is the explicit knowledge. However, this relation does not require the conservation law, and is not a pure mathematical formulation since nobody can measure the value

of tacit knowledge. Actually, due to the unconscious nature of the tacit knowledge we don't know how much we know. But this relation is important for knowledge management since each employee brings much more knowledge into company than any diploma can show. In the same time, the loss of knowledge when an employee retires is much more than the explicit correspondent of the job description of the work he performed. Also, this relation help us to understand the value of the total knowledge in an interdisciplinary field: "Operating in interdisciplinary environments like these, professionals and managers inevitably develop important practical knowledge about related disciplines, not to mention relationships with other experts who they can turn on. The cumulative knowledge gained by working with others in an environment that integrates complex specialities creates kinds of expertise that are very hard to replicate"(DeLong, 2004, p.17). In the knowledge field, tacit knowledge can be transformed into explicit knowledge through the process of *externalization*, and explicit knowledge into tacit knowledge through the process of *internalization* (Nonaka and Takeuchi, 1995). However, unlike the similar transformations in the energy field where rigorous mathematical expressions govern these transformations, in the knowledge field there are no quantitative relations established so far. This could be a real challenge for the future research in knowledge dynamics (Bratianu, 2009).

A parallel between knowledge field and thermal energy field

As a science, *thermodynamics* is concerned with the generation, transport, and dissipation of heat as a form of energy. That means also the transformation process of mechanical work into heat, and of variation of heat into mechanical work in complex systems. The general equation of these transformations can be written as follows:

$$\Delta E = W + Q \qquad (2)$$

where: ΔE – energy variation from an initial state to a final state; W – mechanical work performed by the system, and Q – heat input to the system. By analogy, we may write for the knowledge field:

$$\Delta K = KW + KQ \quad (3)$$

where: ΔK – knowledge variation; KW – cognitive work, and KQ – emotional heat. This relation is strictly qualitative and it introduces a difference between a cognitive process and an emotional one. By *cognitive work* we may refer to any knowledge processing event which is capable of generating action at individual or organizational level. In the field theory, any non-uniform distribution in time or space generates forces, and any variation of these forces generates fluxes which tend to produce uniformity. This is true for the knowledge field as well, and

we may coin the concept of *cognitive work* as a result of variation of cognitive fluxes at the individual level or organizational level. A cognitive work is actually any flux which may generate, or which can be generated by a knowledge field variation. It is a step further from the concept of *working knowledge* (Davenport and Prusak, 2000). By *emotional heat* we may consider the emotional flux which has been induced or produced as a result of a knowledge field variation. Let us consider that we are waiting for the final result of a job interview. When it is communicated to us, we have a variation in our knowledge level, and we perform a cognitive work in interpreting this result. In the same time, an emotional flux is generated according to our expectation level: if we get the wanted job we are happy, if not, we are unhappy. Like mechanical energy, the cognitive work has an extensive dimension which eventually can be measured. Like thermal energy, the emotional heat has both extensive and intensive dimensions. In this case, the extensive dimension refers to quantity of heat expressed in Joule, and the intensive dimension refers to temperature expressed in degrees Celsius or Fahrenheit. Although we cannot measure now the intensity of a certain emotion, we can differentiate emotions based on their intensities, which means we can perform a relative evaluation of them. Introducing emotions into the knowledge metaphorical analysis it is in concordance to the Japanese view of oneness of body and mind (Nonaka and Takeuchi, 1995; Nonaka and Konno, 1998).

The second law of thermodynamics has many formulations and interpretations. However, the kernel of this law is that heat can flow by its nature from a body with a higher temperature, toward a body with a lower temperature. These two bodies can be in direct contact, or not. The reverse process can be done only by performing mechanical work. Using our metaphor, we may say that in the knowing process knowledge can be transferred only from a person having a higher knowing level toward a person with a lower knowing level. The reverse process can be done only by performing some intellectual work. This idea can be further developed by using similarities between the Carnot cycle used in thermodynamics and the SECI cycle used in knowledge management. In knowledge transfer and sharing we may include both tacit and explicit knowledge. In knowledge intensive organizations, knowledge sharing is a core competency. People need to actively share and discuss their practice which is generating tacit knowledge. "*While knowledge is often thought to be the property of individuals, a great deal of knowledge is both produced and held collectively. Such knowledge is readily generated when people work together in the tightly knit groups known as communities of practice*" (Brown and Duguid, 1998, p.91).

Knowledge field and entropy

The concept of *entropy* has been defined for the first time by R.J.E. Clausius in 1865, in relation with the second law of thermodynamics. Clausius' definition of entropy change could be expressed verbally as being the amount of energy dispersed reversibly at a specific temperature T. From a statistical viewpoint, the entropy is the degree of disorder or chaos that exists or is created, a connection that has been revealed by investigations of Boltzmann and Gibbs in statistical physics. Entropy can be express as (Schroedinger, 1967):

$$\text{Entropy} = k \log D \qquad (5)$$

where k is the so-called Boltzmann constant, and D is a quantitative measure of disorder. Also, D can be interpreted as a probability of a macrostate of a given system, produced by its chaotic microstates. Transitions from less probable to more probable macrostates and towards equilibrium all increase entropy and consume exergy, the work potential of the given system. In the source domain of energy, entropy can be interpreted also as a measure of energy distribution and the capacity of the energy field to do useful work. The higher the entropy, the less value of the energy field (Handscombe and Patterson, 2004). In the target domain of knowledge, entropy can measure the distribution of knowledge field at the organizational level. A highly structured and non-uniform knowledge field has a low entropy value. This is a typical situation in the old view of the industrial management, where the management hierarchy is highly vertically structured and top-down knowledge flow is very well controlled (Robbins and DeCenzo, 2005). In the new knowledge creating companies, the knowledge field is less structured due to a flat management hierarchy and an intensive knowledge transfer on both vertical and horizontal directions takes place "*Hierarchies are very good at aggregating effort, at coordinating the activities of many people with widely varying roles. But they're not very good at mobilizing effort, at inspiring people to go above and beyond. When it comes to mobilizing human capabilities, communities outperform bureaucracies*" (Hamel and Breen, 2007, 62). Thus, entropy can be in the target domain an important indicator to describe organizations and their management performance. For instance, the entropy of a platoon of soldiers is very low because they are highly constrained by regulations to execute the top-down orders. By contrast, the entropy of a creative company with a lax lattice management is high since knowledge is flowing in all directions trying to level up the organizational knowledge field. It is interesting to conclude that management is by its nature *anti-entropic*, since it implies order and well defined knowledge clusters associated to well defined organizational structures. Knowledge entropy is reduced by performing cognitive work in designing these organizational structures and all internal regulations for their functioning. The final result is a perfect mechanical organization operating by bureaucratic procedures. It is a very stiff organization with a low innovation level and a low adaptive capacity. The new types of

organizations are more flexible, with less structured managerial hierarchies, and higher level of innovation (Leonard-Barton, 1995; Christensen, 2003). That means a higher level of knowledge entropy. The future of management is the *entropic management*, which means a substantial change in the organizational structures and dynamics.

Conclusion

Knowledge management is still a growing research domain with inputs coming from all sciences. Since the first inputs came from the operational management dealing with tangible assets, knowledge has been considered as a stuff. This is a static and linear perspective with many limitations. Then, trying a dynamic view some researchers considered the flow of knowledge throughout organization. The purpose of this paper is to show a new perspective of knowledge interpretation: knowledge as a field. The input comes from energy systems and it is important since this interpretation overcomes many limitations from all previous metaphors. The knowledge field is nonlinear, nonhomogeneous and nonuniform. The parallel with the energy field allows us to consider the tacit knowledge as potential energy, the explicit knowledge as kinetic energy, and the emotional knowledge as thermal energy. Thus, we can understand much better the relations between these forms of knowledge and the possible transformations from one form into another. The field perspective opens new opportunities to advance the research in knowledge dynamics and to find out the nonconservative laws of all these above transformations.

References

ANDRIESSEN, D. 2008, "Knowledge as love. How metaphors direct our efforts to manage knowledge in organisations", *Knowledge Management Research & Practice*, No.6, pp.5-12.

ANDRIESSEN, D. 2006, "On the metaphorical nature of intellectual capital: a textual analysis", *Journal of Intellectual Capital,* Vol.7, No.1, pp.93-110.

ANDRIESSEN, D. & VAN DEN BOOM, M. 2007, "East is East and West is West and (n)ever its intellectual capital shall meet", *Journal of Intellectual Capita*l, Vol.8, No.4.

BRATIANU, C. 2009, "Challenges for knowledge management research", in: BRATIANU, C., LIXANDROIU, D. & POP, N. (eds.) *Business excellence*, Vol.I, pp.52-56. Brasov: Infomarket.

BRATIANU, C. 2009, "Emotional knowledge dynamics", in: *Proceedings of the 4th International Conference on Knowledge Management: Projects, Systems and Technologies*, 6-7 November 2009, Bucharest, pp.237-239.

BRATIANU, C. 2007, "Thinking patterns and knowledge dynamics", Proceedings of the 8th European Conference on Knowledge Management, Vol.1, pp.152-157, Barcelona, Spain.

BRATIANU, C. & ANDRIESSEN, D. 2008, "Knowledge as energy: a metaphorical analysis", in: *Proceedings of the 9th European Conference on Knowledge Management*, Southampton Solent University, UK, 4-5 September 2008, pp.75-82. Reading: Academic Publishing.

BROWN, J.S., DUGUID, P. 1998, "Organizational knowledge", *California Management Review*, Vol.40, No.3, Spring, pp.90-111.

CHRISTENSEN, C.M. 2003, *The innovator's dilemma*. New York: HarperBusiness essentials.

DAVENPORT, T.H. & PRUSAK, L. 2000, *Working knowledge. How organizations manage what they know*. Boston, Massachusetts: Harvard Business School Press.

DELONG, D.W. 2004, *Lost knowledge. Confronting the threat of an aging workforce*. Oxford: Oxford University Press.

GARDNER, H. 2006, *Five minds for the future*. Boston, Massachusetts: Harvard Business School Press.

GARDNER, H. 1993, *Multiple intelligences. New horizons*. New York: Basic Books.

HAMEL, G. & BREEN, B. 2007, *The future of management*. Boston, Massachusetts: Harvard Business School Press.

HANDSCOMBE, R.D. & PATTERSON, E.A. 2004, *The entropy vector*. London: World Scientific.

HILL, D. 2008, *Emotionomics. Leveraging emotions for business success.* Revised edition. London: Kogan Page.

LEONARD-BARTON, D. 1995, *Wellsprings of knowledge. Building and sustaining the sources of innovation.* Boston, Massachusetts: Harvard Business School Press.

LAKOFF, G. & JOHNSON, M. (1999) *Philosophy in the flesh. The embodied mind and its challenge to the western thought.* New York: Basic Books.

LAKOFF, G., JOHNSON, M. (2003) *Metaphors we live by*. Chicago: The University of Chicago Press.

NONAKA, I., KONNO, N. 1998, "The concept of 'Ba': building a foundation for knowledge creation", *California Management Review*, Vol.40, No.3, pp.40-54.

NONAKA, I., TAKEUCHI, H. 1995, *The knowledge-creating company. How Japanese companies create the dynamics of innovation*. Oxford: Oxford University Press.

POLANYI, M. 1983, *The tacit dimension*. Gloucester, Massachusetts: Peter Smith.

ROBBINS, S.P., Decenzo, D.A. 2005, *Fundamentals of management. Essential concepts and applications*. International edition. New Jersay: Pearson Education.

SCHROEDINGER, E. 1967, *What is life? Mind and matter*. Cambridge: Cambridge University Press.

SENGE, P. 1990, *The fifth discipline. The art and practice of the learning organizations*. London: Random House.