A Transdisciplinary Approach on the Advanced Sustainable Knowledge Integration

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ABSTRACT

The paper presents a new, transdisciplinary approach on the DIKW (Data, Information, Knowledge, and Wisdom) hierarchy, offering arguments that the hierarchy is unsound and even methodologically undesirable. The purpose of the paper is to identify a new and more complete perspective on knowledge integration. This model is based on another scale, in a synergistic-generative transdisciplinary manner, in order to transfer and implement knowledge in the knowledge based society/economy context. The new knowledge pattern, named DIMLAK (Data, Information, Messages, Learning, and Advanced Knowledge) is reconfigured to explain the way the advanced knowledge is achieved as a top level of the transdisciplinary integrated and integrative knowledge system. The proposed model is working complementarily as breadth through depth approach, opening a new vision in the knowledge achieving process.

Keywords: transdisciplinarity, advanced knowledge, sustainable all life learning, breadth through depth approach.

THE ROOTS OF THE KNOWLEDGE AND THE WAY TOWARDS THE ADVANCED KNOWLEDGE

Knowledge became a very hot issue and knowledge management is the hottest subject of the day, the main question for the knowledge-based society/economy (KBS/E) being the way the advanced knowledge is produced, shared and implemented (Becera-Fernandez et al, 2004; Pop & Maties, 2011). Because knowledge refers to the state of knowing, acquaintance with facts, truths, or principles from study or investigation every level of the knowledge achievement has to be analyzed from a synergistic systemic approach with the

7 questions paradigm (where, when, who, with whom, what, how, and why), defining the context of the knowledge based society/economy (KBS/E) (Pop, 2011). The importance of the knowledge is linked with a tremendous increasing level of the economic growth correlated with a permanent threat for crisis, and unprecedented possibilities of producing and sharing the knowledge. For this goal it is very important to choose the best definition of the knowledge from a lot of existing possibilities making a net distinction between what does mean data, information, knowledge, wisdom and understanding (Zins, 2007). Even the knowledge is considered as *"the cumulative stock of information and skills derived from use of information by the recipient"*, with a consistent difference between data (signals which can be sent by an originator to a recipient), and information (data becoming intelligible to the recipient) (Burton-Jones, 1999), or as *"an organized body of facts, principles, procedures and information acquired over time"* (Blanchard & Thacker, 2009), knowledge is referring to what individuals or organizations (NGO, company, institutions, etc) know how to do (human and social knowledge), acting as rules, processes, tools and routines (structured knowledge) (Davenport & Prusak, 1998; Noe, 2008). All kind of knowledge could be attained, possessed and implemented by individuals in communitarian contexts, as productive knowledge, to get values, knowledge communities, knowledge being considered as culture in a historic context (McCarthy, 1996; Hildreth & Kimble, 2004). Especially the "communities of practice" are of a big interest in the context of the knowledge based society/economy (KBS/E) (Fotea et al, 2012). Another such of knowledge communities are Transdisciplinary places, industries, technologies, work and education (Hyun, 2011), some of them being: Transdisciplinary Technoplis Spaces as innovative open territories (Doignon & Falmagne, 1999; Hakkarainen et al, 2004; Pop, 2011), Teaching factory (Alptekin, et al, 2001), Mobile mechatronical platform (Papoutsidakis et al, 2008), Knowledge Intensive Firm (KIF) (Sveiby, 2000), Transdisciplinary Reform School Education 2000+ (Bertea, 2005), and others.

Knowledge is an activity not an object, so, it can be managed only as explicit knowledge (Collins, 2010). The explicit and tacit knowledge are different one to another, so explicit knowledge could be codified through information (know-what), and tacit knowledge is including skills such as insight, creativity and judgment (know-how). A more complete answer in this sense is given as follows: *„knowledge is the combination of data and information, to which is added expert opinion, skills and experience, to result in a valuable asset which can be used to aid decision making"* (Zeleny, 1988; Sveiby, 2001). The current concept about knowledge is that it *"proves itself in action"* being focused on results (Drucker, 1998). In the knowledge process there are different sequences, as acquisition, creation-production, dissemination-distribution-exchange, and use-implementation of knowledge with a possible depreciation and obsolescence of knowledge when it is used (Hildreth & Kimble, 2004; Hakkarainen et al, 2004; Bernstein, 2009; Helm Stevens et al, 2010). It is very important to know when and in what context the knowledge would be determined by information, deciding which information is relevant, and how it is to be used.

It is important to consider that knowledge has an intentional character, being strictly connected with human projects, as an exercise of the highest and defining capabilities of humans, a fulfillment of human nature, a transgenerational treasure, with a very important

spiritual component (Nicolescu, 1996; Gitt, 1997; Pop, 2011). The existing models regarding knowledge are integrated transdisciplinary in a generative-synergistic way by the Synergistic Contextual Message Model, which is working with three spheres of the communicational process, **Pathos** with its specific rules: responsibility, credibility, and deference for Sender; **Ethos** with the rules: receptivity (choice), availability (accountability), and involvement (action), for Receptor; and **Logos** for Contextual Message, with the rules: quantity and quality of the message, the contextual relevance of the message, and manner of transmission (cod, channel), in a specific transdisciplinary way (Pop, 2011).

A TRANDISCIPLINARY PERSPECTIVE ON THE KNOWLEDGE INTEGRATION

Transdisciplinarity as understanding (top-down approach), learning and practicing (bottom-up approach) is based on an active process, occurring either intentionally or spontaneously, that enables to control information, thus to question, integrate, reconfigure, adapt or reject it (Nicolescu, 1996; Pop, 2011). The four pillars of the transdisciplinary knowledge: learning to know (creativity through adequateness and innovation), learning to do (action through competence and performance), learning to be (authenticity through integrity and excellence) and learning to live with other people (participation through communion and apprenticeship) are working in a new framework, for learning and achieving knowledge, as an objective rational extrinsic logical issue, and understanding as an ethic-semiotic issue, the subjective relational dimension of knowledge (Delors, 1996; Pop & Mătieş, 2011). Every pillar of transdisciplinary knowledge process can be integrated to explain the perspective of achieving knowledge in the knowledge based society/economy (KBS/E), with a new transdisciplinary epistemology, a new creative logic of the included middle, and a new ontology (Nicolescu, 1996; Soritau & Pop, 2014). It is very important to understand the new synergistic-generative transdisciplinary model about the perspective of the knowledge integration from the thematic-curricular disciplinary (predisciplinary, monodisciplinary or codisciplinary) level to the synergistic one, as structural (interdisciplinary), functional (crossdisciplinary) and generative (transdisciplinary) stages, passing through the methodological (multi and pluridisciplinary) level (Soritau & Pop, 2014).

The transdisciplinarity gives a better explanation then the existent models of the emergence of the epistemic teaching-learning paradigm, that of the synergistic identity of the informergic knowledge, as a new transthematic generative way of education, in order to have a better understanding of the knowledge integration process in a creative context (Bertea, 2005; Montuory, 2006; Pop & Mătieş, 2011). The transdisciplinary approach is based on the equilibrium between the outside (with its extrinsic active knowledge aspect) of the person and his inside (with its intrinsic reactive knowledge aspects), the transdisciplinary way of the knowledge being the only way to realize the integration of the rational knowledge of things (by doing) and relational understanding of the world (by being) (Nicolescu, 1996; Pop & Mătieş, 2011; Jashapara, 2011). The transdisciplinary approach is relevant to and contextualized within the full complexity of the real world, and

seeks to identify, integrate, and act upon points of relationship among centers of knowledge-making, entailing an ontological perspective of the world integrated as a networking whole, in a needed balance between globally and locally tendencies, as well (Slaus, 2003; Hakkarainen et al, 2004).

There is a permanent questioning and crossing the boundaries, in order to bridge the gaps, to cancel the walls by trandisciplinary experts within a continuous knowledge process as a sustainable all life learning process (lifelong learning, wide life learning, learning for life) (Pop, 2011). Such a transdisciplinary work does imply a critique of the so named *'ivory tower'* conception (depth approach) (Nicolescu, 1996), building a *"global village"* as transdisciplinary spaces of knowledge (breadth approach) (Hyun, 2011).

TRANSDISCIPLINARY BREADTH THROUGH DEPTH APPROACH OF THE ADVANCED KNOWLEDGE INTEGRATION

The end of the DIKW hierarchic pyramid

The DIKW (data – information – knowledge – wisdom) model has ancient roots in the poem "The Rock" of T.S. Eliot (Zelenyi, 1987), becoming a great idea when it was first proposed, being determined by a very complex context put on the way through the very important aspects of the integrative process in the Knowledge based Economy/Society (Zelenyi, 1987; Pop, 2011). Because of the very strong connection between data and information, the knowledge was considered as a valuation of information, the way the information becomes knowledge being one of the most important problem. The biggest question is what does represent "knowledge" in the DIKW pyramid, and how is it correlated with data and information, in connection with the implication of the fact that knowledge would be derived by filtering information, considering some facts by combing through databases (Rowley, 2007). A very interesting definition considers that knowledge transforms *"information into instructions"*, being very closed to the necessity to achieve skills in an informational context of a sustainable education (Ackoff, 1989; Bertea, 2005; Montuori, 2006).

There is an apparent confusion about the role of knowledge, wisdom and understanding, processed as a controversy about the top position of the wisdom against the knowledge, considered not as „*the highest of the intellectual goods, of higher value is understanding and, beyond that, wisdom"* (Mortimer, 1985). Knowledge management has largely relied on the DIKW pyramid when "wisdom" was added as a guide of knowledge process (Ackoff, 1989; Rowley, 2007). There are some critiques on the DIKW Pyramid model of knowledge integration (fig.1), because the hierarchy proposed is focused only on specific modes of data, information, knowledge, and wisdom, neglecting important distinctions of them, including the path of the Knowledge Management, because in practice the DIKW pyramid tends to cause a number of problems for KM practitioners (Becerra-Fernandez et al, 2004; Liew, 2007). One of these problems is that there is no agreement on the possible boundaries between the different elements involved in the DIKW pyramid model. More

fundamentally, from a KM practitioner's point of view, the DIKW model offers no guidance as to where the KM work should be focused within an organization, to deliver business results, and to maximize them (Jashapara, 2011). The Knowledge and Wisdom can only be created by an efficient network of humans, but data can be generated with a little human intervention, as measuring process.
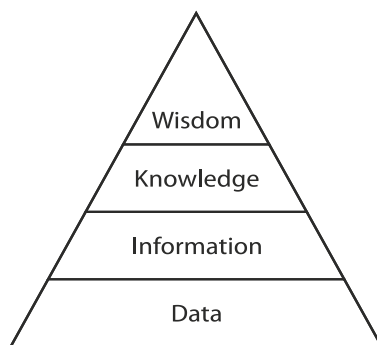

Figure 1: DIKW hierarchy pyramid (Rowley, 2007)

To become information data must be examined by humans, who have then disperse and convert into tacit and explicit forms in order to assure the creation of the knowledge, by repeating several times, and sometimes by different groups of humans, to achieve wisdom (Ackoff, 1989; Browning et al, 2002; Rowley, 2007). So, knowledge creation, necessary to develop wisdom, works best in an open and transparent human social network across which information moves rapidly. The faster information flows to individuals, the faster the process of knowledge creation and the easier it is to make appropriate decisions (Helm Stevens et al, 2010).

There are two disputed issues in the DIKW hierarchic knowledge pyramid, first of them being wisdom, as meaning and ability to see the long-term consequences of any act and evaluate them relative to the ideal of total control (global competence). The second issue under a controversy is understanding, connoting only an ability to assess and correct possible errors, different from "wisdom" as a top in the knowledge pyramid (Frické, 2009). The DIKW pyramid model widely used by many KM practitioners, vendors, consultants, and scholars, is suggesting that each of the four elements, Data (D), Information (I), Knowledge (K), and Wisdom (W) of DIKW Pyramid is working separated and distinctive from the others, in an existing hierarchical relationship, one of the elements being translated "upward", in a different state through some unknown process (fig.1) (Frické, 2009).

Because of the lack of possibilities to establish what kind of data, information or knowledge are processed, and how does that processing occur, to whom is delivered the Data, Information or Knowledge, and for what use, the siren is calling for the DIKW pyramid (Frické, 2009). The DIKW model does not help at all in the search for a way to make organizations smarter (Allee, 1997; Noe, 2008). So, there are very pertinent critical

observations on the topic of the DIKW that consider this hierarchy as unsound and methodologically undesirable, the way through a new model being open, and the DIKW model must die (Frické, 2009; Vala Webb, 2014).

Transdisciplinary DIMLAK model for advanced knowledge integration

The arguments presented before have to be correlated with the fact that the knowledge is a human product, both individual and communitarian, being considered as a complex process, social, goal-driven, contextual, and culturally-bound more then a simple filtering process or algorithms (McCarthy, 1996; Helm Stevens et al, 2010; Hakkarainen et al, 2004). In order to make true connections between the components of the knowledge hierarchy, is necessary to introduce a new model for knowledge management (KM) that meets new transdisciplinary criteria introducing new necessary levels and finally reconfiguring the whole knowledge pyramid removing it by another approach.

A simple database and information become knowledge only when they are understood, manipulated and connected to a purpose or idea, so the KM must gain the ability to capture, share and manage knowledge, as process and as product, as well (Alavi & Leidner, 2001; Jashapara, 2011; Pop, 2011). If this is accepted the unique conclusion is that DIKW must die (Vala Webb, 2014), achieving the sunset of its existence, the reconfiguring and the improvement of the existent model should become a natural process. As consequence it is proposed a new type of knowledge integration, from a transdisciplinary perspective, through an integrative sustainable all life learning process, using the semiophysical synergistic contextual message model, as a synergistic-generative significant evolution of the knowledge process from the monodisciplinary to the transdisciplinary context of learning in the knowledge based society/economy (KBS/E), in order to achieve advanced knowledge (Bertea, 2005; Pop & Mătieş, 2011; Soritau & Pop, 2014).

The new DIMLAK proposed model is not a pyramid, but a heterarchic-hierarchic configuration with Data, Information, synergistic contextual Message, integrative sustainable all life Learning/teaching, Advanced Knowledge, as steps, with expertise as final goal, expressed through wisdom and skills, in order to integrate the knowledge with the truth. The stages of this model are presented in fig. 2 as waves of knowledge with different semiophysical processes (Helm Stevens et al, 2010; Soritau & Pop, 2014). Knowledge has to combine data and information, in order to connect expert opinion (top down approach) with skills and experience (bottom up approach), as a finally valuable asset useble for decision making.

Starting from data, as an abundant, vital and necessary resource, it is necessary to utilize new ways to channel them into meaningful information, which has to become knowledge by a specific filtering process through the synergistic communication sequence, as synergistic contextual message, through sustainable all life teaching/learning process, as advanced knowledge, in order to achieve the goal, the expertise as wisdom and skills (Pop,

2011). Data represents the bottom ground statistic level of knowledge process as a product of observations, measuring without no value until they are processed into a usable form to become information (Hey, 2004; Zins, 2007).

Information (syntactic level) is related with descriptions, definitions, or perspective on reality, contained in answers and questions by absorbing the sense from data as a transitional stage to knowledge passing through contextual message stage as subject by a learning process (Buckland, 1991; Bates, 2005). Synergistic Contextual Message (semantic) level is working by filtering the information, with attention focused on the meaning and truth, and other semiotic properties of the recorded marks (Pop & Maties, 2011; Soritau & Pop, 2014).
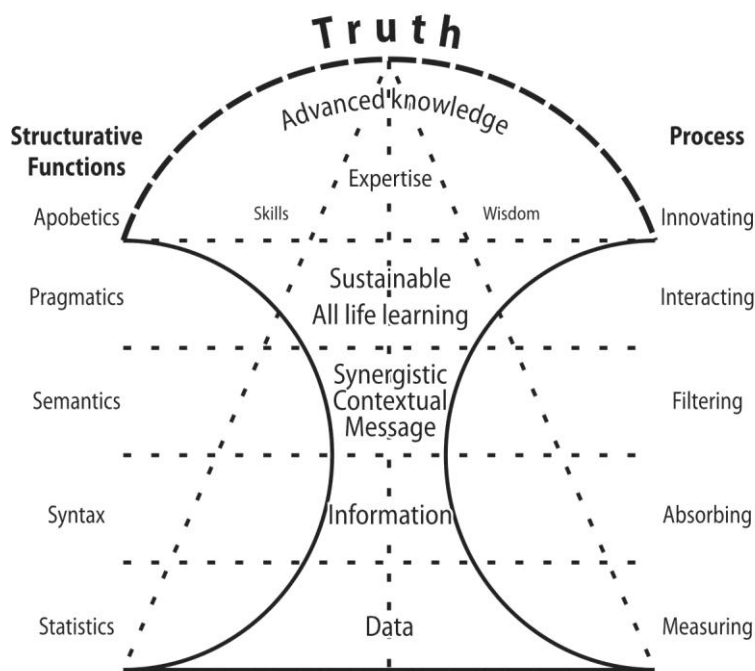

**Figure 2: Transdisciplinary DIMLAK breadth
through depth approach model**

Information has a significant potential if it is properly managed, all knowledge being based on information but not all information becomes mandatory knowledge. The most important question is how knowledge management could help to transform information into trends, products and increased profitability for businesses (Fotea et al, 2012). Integrative sustainable all life learning (pragmatic level) is working in a teaching/learning process as a transdisciplinary multimedia theory, describing a movement toward integrated lessons in order to help people to make connections across curricula, using modern methods and

tools, in order to help the actors of this process to make linkages across any borders, barriers (curricula, methodologies, tools of knowledge, or other kind of thresholds) (Lave & Wenger, 1991; Bertea, 2005), in a structural-functional-generative context comprising specific strategies, practices, methods, or approaches (Hyun, 2011; Pop, 2011). Advanced Knowledge (top/apobetic level) has as final goal the Expertise, as Wisdom and Skills (Gitt, 1997; Pop, 2011), by embodying principles, insights, or archetypes, in ethic/moral pattern to integrate the knowledge with the desired Truth. The main question is the way the advanced knowledge is produced, shared and implemented starting from data and information (Zeleny, 1987).

Knowledge and intellectual capital are considered as a primary source of production and value in an organization (Davenport & Prusak, 1998; Strathern, 2007), as collective value of the capabilities, knowledge, skills, life experiences and motivation of the workforce, reflecting the thinking, knowledge, creativity and decision making people to participate in organizations (Allee, 1997). The importance of human capital in the innovation process underlies the demand for increased skills, including teamwork and cognitive skills, in a sustainable all life learning process, in order to adapt to a continuous change (Nowotny et all, 2001; Hyun, 2011). Expertise is considered the top level in achieving integrated knowledge with two aspects, wisdom (top down approach) and skills (bottom up approach), both of them being integrated transdisciplinary through included middle (Nicolescu, 1996).

Wisdom represents an integrating experience arising when the foundational principles responsible for the patterns representing knowledge are understood as what they are, creating its own context even more so than knowledge does (Davenport & Prusak, 1998; Jashapara, 2011). As a top down level of the advanced knowledge, wisdom requires synthesis, bringing together a wide range of knowledge created from an important amount of information representing a tremendous quantity of data. Skills are considered to be a permanent objective of the knowing process, starting from the bottom, with a question about what is knowledge management, and why is it so important offering some emerging perspectives in response, as a part of the human capital in the innovation process, including teamwork and cognitive skills, and all life learning in order to adapt to continuous challenging changes.

The stock of the human capital, as potentiality, is reflected in the level of skills, competencies and knowledge of the members of society, being built up over time mainly through investment in education (public and private) (Düntsch & Gediga, 1995; Albert & Lukas, 1999; Rainey, 2002; Bertea, 2005; Hyun, 2011). From the transdisciplinary point of view the Truth, as final goal of the knowledge integration process, can be achieved as *hidden third* integrating the fundamentals through every stage of the proposed DIMLAK model (Nicolescu, 1996; Nonaka, 1996; Pop, 2011).

CONCLUSIONS

Transdisciplinarity perspective on knowledge integration introduces interpretive approaches, critical science and grounded theory, exploring the values in a new synergistic generative context to create a new praxis through a holistic breadth through depth inquiry. The new proposed transdisciplinary model is working pragmatically by a sustainable all life learning, using integrative learning concepts, as a movement toward integrated lessons helping people to make connections across curricula, putting together skills and knowledge from multiple sources and experiences; applying skills and practices in various settings; utilizing diverse and even contradictory points of view; and, understanding issues and positions contextually.

The result of this inquiry is the DIMLAK model, as a holistic way of the knowledge integration, instead of that is known as DIKW Hierarchic Pyramid of Knowledge. The different heterarchic-hierarchic stages of knowledge integration are represented as a transdisciplinary chain, as follows: Data (D, statistics approach) → Information (I), as syntactic way to relate descriptions, definitions, or perspectives → Synergistic Contextual Message (M), as semantics → Sustainable integrative all life Learning (L), as pragmatics pattern comprising strategy, practice, method, or approach → Advanced Knowledge (AK), as apobetics embodying principle, insight, moral, or archetype, to attend the desired level of Expertise (Wisdom as top-down perspective, and Skills as bottom-up perspective), in order to achieve its final goal, the Truth, representing an emergent continuum flow. In this way the new perspective of the knowledge management creates a better understanding, a transdisciplinary one, about the knowledge as dynamic synergistic integrative process.

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