The Entropic Knowledge Dynamics as a Driving Force of the Decision-Making Process

Constantin Bratianu[1, 2] and Elena-Mădălina Vătămănescu[3]
[1]Bucharest University of Economic Studies, Romania
[2]Academy of Romanian Scientists, Romania
[3]National University of Political Studies and Public Administration, Romania
constantin.bratianu@gmail.com
madalina.vatamanescu@facultateademanagement.ro

Abstract: The entropic knowledge dynamics departs from the iceberg metaphor used for the explicit and tacit knowledge by introducing the energy metaphor, which leads to the multifield theory of organizational knowledge. According to this theory, there are three fundamental fields of knowledge: rational, emotional, and spiritual. Each of these fields transforms continuously into another field, creating a synergy effect which impacts the decision making process. In this front, the purpose of this paper is to describe the new entropic dynamics approach and to investigate its impact on the decision-making process by using quantitative research methods. Experts in a workshop debated on the role played by each field of knowledge and the entropic dynamics on decision making. Then, a questionnaire has been developed containing 30 questions structured on two levels of complexity. The first level contains questions addressing the role played by each of the three forms of knowledge on decision making while the second level contains questions addressing the way knowledge dynamics impacts decision making. Since we are interested in the generic phenomena of decision making and the role played by knowledge dynamics, we invited students in management and business administration from two important universities in Romania to participate in the questionnaire-based survey during January and February 2017. Finally, 399 valid questionnaires were retrieved. This research demonstrates that students attach the highest importance to the Entropic Knowledge Dynamics, thus, identifying knowledge transformations and interactions as the most prominent factor. The entropic knowledge dynamics shows up as a driving force of the decision-making process. As the findings also indicated, there are no statistically significant differences among the cohorts of students in terms of gender and education level; nevertheless, setting the faculty year as criterion brings forward novel insights in that three out of the four considered knowledge dimensions displayed meaningful differences.

Keywords: rational knowledge, emotional knowledge, spiritual knowledge, knowledge dynamics, decision making, multifield theory of organizational knowledge

1. Introduction

The dynamic theory of organizational knowledge creation has been proposed by Nonaka (1994), and developed by Nonaka and Takeuchi (1995), and Nonaka et al. (2008). This theory is based on *the iceberg metaphor* of knowledge which defines explicit knowledge and tacit knowledge, and on the SECI model which introduces four conversions for knowledge: Socialization, Externalization, Combination, and Internalization. Explicit knowledge represents that part of the individual knowledge that can be expressed by using a natural or symbolic language (Davenport and Prusak, 2000; Nonaka and Takeuchi, 1995). Explicit knowledge can be interpreted as being the visible part of an iceberg with respect to the water surface. Tacit knowledge is a result of direct experience and hard to formalize and transfer to others (Baumard, 1999; Davenport and Prusak, 2000; Polanyi, 1983). Tacit knowledge can be interpreted as the hidden part of the iceberg, which is under the water surface and cannot be seen. As the hidden part of the iceberg is much larger than the visible part of it, tacit knowledge is a result of the direct experience and it is much complex and larger than the explicit knowledge. According to Nonaka and Takeuchi (1995, p. 8), "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". Tacit knowledge can be shared between people by using body language and imitation during *socialization*, and can be transformed into explicit knowledge at the individual level by *externalization*. Explicit knowledge can be shared and amplified in a social context by *combination*, and can be transformed into tacit knowledge at the individual level by *internalization*. Nonaka's model of knowledge creation dynamics has been adopted by many researchers due to its simplicity and intuitiveness. However, the dynamics embodied in this model is based on the iceberg metaphor and idealistic processes that limit its power of explanation (Bratianu, 2010; Glisby and Holden, 2003; Gourlay, 2006). Also, tacit knowledge sharing during socialization has to overcome the difficulty of the internal stickiness (Szulansky, 1996).

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The overcoming of the limits of the Nonaka's paradigm of knowledge dynamics can be performed only by changing the knowledge metaphor, since thinking is a metaphorical process (Lakoff and Johnson, 1980, 1999; Moser, 2000). The mind uses metaphors as a means to improve our understanding about new concepts, especially when they reflect intangible entities, by using well-known tangible objects. As Pinker (2008, p. 241) underlines, "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 yet understand". The research performed by Andriessen (2006, 2008, 2011) and Andriessen and Boom (2007) in the field of intellectual capital demonstrates that any definition of *knowledge* is bounded by the target domain of the metaphor used. "Knowledge is not a concept that has a clearly delineated structure. Whatever structure it has, it gets through metaphor. Different people from different cultures use different metaphors to conceptualize knowledge" (Andriessen and Boom, 2007, p. 3). Thus, understanding Ikujiro Nonaka's theory on knowledge creation dynamics implies a good understanding of the Japanese education and culture, which generate a different organizational behavioral than in the Western companies.

A paradigmatic shift in the metaphorical thinking concerning the concept of *knowledge* was done by Bratianu and Andriessen (2008) by introducing *the energy metaphor* of knowledge. The shift from conceptualizing knowledge as an *iceberg*, *stock*, or *flow* (Bolisani and Oltramari, 2012; Nissen, 2006; Nonaka et al. 2008) to *energy* opens new directions towards the understanding and research of knowledge and its contribution to the decision-making process (Baron, 2000; Blake, 2008; Hill, 2008; Kahneman, 2011; Vătămănescu et al. 2016). These new directions will be discussed in the next section of this paper. In the light of this new paradigm, the research questions of the present study are the following:

RQ1: Are there any differences in the capitalization of knowledge fields when people make decisions?
RQ2: To what extent is the entropic knowledge dynamics important to people when making decisions?
RQ3: Are the subjects' socio-demographic characteristics relevant in the capitalization of knowledge fields and dynamics when people make decisions?

In order to answer to these questions, the paper presents an empirical research based on a questionnaire addressed to students in management and business administration from two top universities in Romania. The structure of the present paper is organized as follows: after this brief introduction a theoretical analysis will reveal the structure of knowledge in the new paradigm, and then the research methodology and findings will be further presented. Finally, the paper advances the formulation of the main research conclusions.

2. Theoretical analysis

The first generation of knowledge metaphors used physical objects or stocks of such objects as a source field (Andriessen, 2006; Bolisani et al., 2012; Borgo and Pozza, 2012; Davenport and Prusak, 2000). Objects are placed in the source domain and some of their attributes mapped onto the target domain of knowledge. Thus, as a consequence of this metaphor, knowledge can be accumulated, stored, moved, distributed and measured. Knowledge as physical objects is the most frequently used metaphor in the published literature dedicated to knowledge, knowledge management, and intellectual capital. In a textual analysis on the metaphorical nature of intellectual capital, which is composed mostly of knowledge, Andriessen (2006) shows that Davenport and Prusak used this metaphor in the first chapter of their book, *Working knowledge: How organizations manage what they know* in proportion of 59% of the total number of all metaphors used in that chapter. Nonaka and Takeuchi used - in the fifth chapter of their well-known book, *The knowledge-creating company: How Japanese companies create the dynamics of innovation* - metaphors based on physical objects in a proportion of 29% of the total number of metaphors used in that chapter. Although this is just an example, it is significant since both books are highly influential and highly cited in knowledge management.

The second generation of knowledge metaphors replaced objects which are static with flows of fluids or stocks-and-flows to make the transition towards dynamics (Bolisani and Oltramari, 2012; Leistner, 2010; Nissen, 2006; Nonaka and Takeuchi, 1995; Nonaka et al., 2008). Flow is so much familiar to everybody that it is used frequently in metaphorical thinking. When using the expression "knowledge flow", people can easily visualize the motion of knowledge both in space and in time within a company. Nissen (2006, p. xx) defines knowledge flow as follows: "To the extent that organizational knowledge does not exist in the form needed for

application or at the place and time required to enable work performance, then *it must flow* from how it exists and where it is located to how and where it is needed. This is the concept of *knowledge flows*".

The energy metaphor of knowledge (Bratianu and Andriessen, 2008) opens a new generation of metaphors which departs from the tangible objects and Newtonian thinking. The main ideas of this new paradigm (Bratianu, 2011a, 2011b, 2015; Bratianu and Orzea, 2013) are the following:

- Knowledge is a field.
- There are three basic fields of knowledge: rational, emotional, and spiritual.
- Knowledge from each field can be transformed into knowledge from another field.

The first idea introduces the attributes of intangibility and nonlinearity. That means that organizational knowledge is not a sum of all individuals' knowledge, but an integration of those entities. The second idea breaks down the tacit knowledge into its main parts and defines emotional knowledge and spiritual knowledge as independent entities. Thus, rational knowledge, emotional knowledge and spiritual knowledge generate a continuous spectrum which leads to the multifield theory of knowledge. As Baumard (1999, p. 19) emphasizes, "Knowledge is the object of a continuum that extends from interpreted information (such as a simple penciled diagram) to the non-representable (premonitions, for example)". The third idea introduces the concept of entropic transformation of one form of knowledge into another, by analogy with thermodynamic transformation of one form of energy into another (Atkins, 2010; Georgescu-Roegen, 1999). This transformation is irreversible. That constitutes the essence of the entropic knowledge dynamics.

Rational knowledge is the result of the rational mind and logical processing information. As Russell (1972, p. 153) explained synthetically, "knowledge consists in reflection, not in impressions, and perception is not knowledge". In the theory of knowledge management (Becerra-Fernandez and Sabherwal, 2010; Davenport, 2000; Hislop, 2005; Nonaka and Takeuchi, 1995), rational knowledge is equated with explicit knowledge and many researchers focus almost exclusively on it. Rational knowledge is obtained by processing rational information in the conscious zone of our brain, a fact for which we are always aware of it. It is a result of the externalization (Nonaka and Takeuchi, 1995) and codification processes (Balconi, 2002; Cacciatori et al., 2012) by using a natural or symbolic language. Rational knowledge has been considered from ancient times to be objective and reliable in comparison with emotional knowledge which is subjective (Russell, 1972). By analyzing comparatively his thoughts coming from the mind and his sensations coming from senses, Descartes discovered that thought is the only attribute that belongs to him and cannot be detached from him: "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). Science and technology have developed based on rational knowledge and rational decision-making. The European education has been conceived almost entirely on rational knowledge, including the economic education.

Emotional knowledge is the result of emotions and feelings and appeared in knowledge management under the umbrella of tacit knowledge (Nonaka and Takeuchi, 1995). However, emotional knowledge is fundamental for our thinking and decision making and must be considered as an independent field of knowledge (Bratianu, 2015; Damasio, 1999; Ekman, 2003; Gladwell, 2005; Goleman, 1995; Kahneman, 2011; Mayer et al., 2004). According to Damasio (1999, p. 26), emotional knowledge represents a specific kind of *wordless knowledge*: "The simplest form in which the wordless knowledge emerges mentally is the feeling of knowing". *Spiritual knowledge* constitutes the third fundamental form of the knowledge spectrum. If rational knowledge reflects the objectivity of the physical environment we are living in, and emotional knowledge reflects the subjectivity of our body interaction with the external world, spiritual knowledge reflects our understanding about the meaning of our existence (Bratianu, 2015; Maxwell, 2007; Zohar and Marshall, 2000, 2004). According to Maxwell (2007, p. 274), "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". Individuals working together in a company share their values and beliefs about life, work, and future generating in time an organizational culture (Ghinea and Bratianu, 2012). Spiritual knowledge becomes essential in building up corporate social responsibility and developing sustainable competitive advantage (Basu and Palazzo, 2008; Benston and Hartgraves, 2002; Branson, 2011; Gao and He, 2017; Lange, 2008; Pinto et al., 2008; Wang et al., 2011). Hussinki et al. (2017) stress the fact that knowledge practices are socially embedded phenomena, affected by the managers' institutional and cultural contexts.

The entropic knowledge dynamics is based on the assumption that these fundamental fields of knowledge are in a continuous interaction, and knowledge from each field can be transformed into knowledge of any other field. This assumption comes from the energy metaphor where one form of energy can be transformed into another form of energy in concordance with the thermodynamics laws. For instance, in the source domain of the energy metaphor, we may consider three forms of energies: mechanical, thermal, and electrical. In the target domain, we assign three corresponding forms of knowledge: rational, emotional, and electrical. From physics, we learn about the transformation of mechanical energy into thermal energy, and the reverse process of transformation thermal energy into mechanical energy. This dynamics from the source domain of the metaphor can be mapped onto the target domain suggesting the transformation of rational knowledge into emotional knowledge and the reverse process of the transformation of emotional knowledge into rational knowledge. A good example of this entropic transformation can be intuition, which constitutes the ability of synthesizing information quickly and effectively in complex situations and short time horizons. As demonstrated by Dane and Pratt (2007), intuition is a nonconscious process which involves holistic associations resulting in affectively charged judgments. This entropic knowledge dynamics is revealed by cognitive sciences and it is considered fundamental in making decisions (Akügn et al., 2012; Damasio, 1999; Fowlie and Wood, 2009; Hill, 2008; Kahneman, 20011; Spender, 2003). Also, the entropic knowledge dynamics plays a crucial role in inter-generational learning dynamics (Bratianu et al., 2011) and business strategizing (Bolisani and Bratianu, 2017; Spender, 2014). Decision-making is a complex process that integrates all of these entropic transformations stressing our human nature, as Doya and Shadlen (2012, p. 913) concluded in their research: "Decision-making brings neuroscience into the domain of ethics, philosophy and the law and thus strikes at what it is that makes us human".

Considering the two systems of thinking, System 1 processing emotional knowledge and System 2 processing rational knowledge, Kahneman (2011, p. 44), remarks: "One of the main functions of System 2 is to monitor and control thoughts and actions 'suggested' by System 1, allowing some to be expressed directly in behavior and suppressing or modifying others". Moreover, "Breakthroughs in brain science have revealed that people are primarily emotional decision makers" (Hill, 2008, p. 2). The dynamics between mechanical energy and electrical energy can be mapped onto the target domain of the energy metaphor to suggest the dynamics between rational knowledge and spiritual knowledge. In knowledge dynamics, rational knowledge contributes to the decision making through direct interaction with the system of spiritual values (Baron, 2000; Blake, 2008; Branson, 2011; Bratianu, 2015; Pinto et al., 2008; Schein, 2004; Wang et al., 2011). Chang (2017, p. 427) emphasizes the important role played by this transformation in developing "the ability of students to build their information ethics cognition" based on the Confucian ethics. Finally, the dynamics of thermal energy and electrical energy known from electricity can be mapped onto the dynamics of emotional knowledge and spiritual knowledge. In psychology, this dynamics can be illustrated by the Budhist monks who try through hard physical and mental work to reduce their negative emotions in order to increase their state of happiness (Ricard, 2007).

In managerial decision-making process, all three dynamics interact in a nonlinear way (Bratianu, 2009) yielding a synergistic outcome. The process is more evident in the case of developing conceptual skills (Bratianu and Vătămănescu, 2016), strategic thinking and organizational change (Blake, 2008; Bratianu, 2015; Kotter, 1996, 2008; Nonaka and Zhu, 2012), ambidexterity vision and organizational learning (Cegarra-Navarro et al., 2017). From an integrated perspective, Hogarth (2001, p. 61) posits that "emotions and affect can, therefore, be important inputs to intuitive thought in the sense that they can induce responses without corresponding awareness". Also, experienced-based tacit knowledge which integrates emotional and spiritual knowledge can be an important input in decision-making. The result of this complex entropic transformation is usually called intuition (Klein, 2003). Intuition is one of the most used practical ways of transforming the accumulated experience into action through judgment and decision-making. Klein (2003, p. xvii) considers intuition as "a natural extension of experience". Thus the intuitive decision-making incorporates the influence of emotional knowledge, spiritual knowledge, and their entropic transformations upon the decision-making without any contribution coming from the rational knowledge and all the theories learned in schools. The entropic dynamics of the knowledge fields is an antecedent of heuristics. According to Moustakas (1990, p. 13), "The heuristic process challenges me to rely on my own resources, and to gather within myself the full scope of my observations, thoughts, feelings, senses, and intuitions".

Starting from the theoretical arguments presented above, the present study addresses the configuration of the entropic knowledge dynamics integrating the cognitive, emotional and spiritual knowledge, the three

knowledge types in their own right, and the decision-making process. Thus, four main factors and the relationships among their components are considered.

The research hypotheses of the study are the following:

H1: When making decisions, students capitalize the entropic knowledge dynamics more than rational, emotional or spiritual knowledge taken separately.
H2: There are significant differences between undergraduates and graduates regarding knowledge-based decision-making processes.
H3: There are significant differences across the student cohorts according to the faculty year criterion.
H4: There are significant differences between the male and female students regarding the knowledge-based decision-making processes.Materials and methods

2.1 Sample

To test these assumptions, we conducted a survey during January and February 2017. A total of 700 students from two top universities in Romania were invited to participate at a questionnaire-based survey describing the way they make decisions, be they rational, emotional or spiritual. Upon acceptance, the subjects were asked to fill in a self-administered questionnaire. Finally, 399 valid questionnaires were retrieved, thus yielding a response rate of 57%.

The structure of the statistical population brought to the fore the following features: the subjects' average age is 21 (M=21.39, SD=2.33), the gender distribution indicating 61.2% females and 38.8% males and the education level 66.7% undergraduates and 33.3% graduates.

2.2 Procedure

The subjects were invited to participate in a questionnaire-based survey by evaluating various assertions rated on a Likert scale with five options: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly agree). Further, the socio-demographic items were meant to approach the general profile of the respondents, consisting of: age, gender, education level, faculty year and university. The sample was deemed to be large enough to analyze the data by means of principal components extraction using SPSS software (version 20) and to provide cogent results.

2.3 Measures

At the conceptual level, Four main dimensions were developed, reflecting the knowledge fields and their entropic dynamics. Each dimension was described by at least three items within a self-constructed questionnaire containing 30 items, formulated as assertions. The rated assertions referred to both attitudes and behaviors, thus allowing an overall image on how students think and act on a common basis when they have to decide on current matters.

The first dimension stressed on the rational knowledge objectivations, including here: a. the need for evidence-based arguments when deciding; b. the performance of objective step-by-step examinations and appraisals as a prerequisite of viable solutions; c. the leverage of rational thinking in providing feasible answers to different problems; d. the exigency to be objective and rational in the decision-making process.

The second dimension, namely Emotional Knowledge, was operationalized by means of: a. the belief that perceptions may provide good solutions to different problems; b. the faith in one's feelings when making decisions; c. the role of emotional intelligence when it comes to making good decisions. Likewise, the third dimension – Spiritual Knowledge – consisted of indicators envisioning the following aspects: a. the perceived influence of cultural values on making good decisions; b. the preservation of a positive attitude when confronted with difficult tasks; c. the valuation of sharing the same values with team colleagues as an important factor in solving group problems and projects.

The fourth dimension, that is Entropic Knowledge Dynamics, integrated the highest number of items with the view to depict various forms of knowledge transformations, as follows: a. the role of intuition on the emergence of multiple good ideas; b. the influence of certain feelings on the imperative to analyze all the data and associated arguments more systematically and thoroughly; c. the examination of external date via

personal experience and expectations; d. the practice to share the lessons learnt with the team on purpose to ensure a common approach on the issue; e. the usage of past experiences to elaborate on good practice; f. the employment of personal values in the process of interpreting data and making decisions; g. the openness to share feelings in order to create a positive climate for the team; h. the openness towards other people's values when working together; i. the influence of working with similar peers in terms of values and principles on a comfortable decision-making process; j. the role of a positive climate within the team makes as an enthusiasm catalyst towards future collaborations.

3. Results and discussion

A factor analysis was computed aiming at the exploration of the factors deriving from the statements and then to bring forward a pertinent measure of the analyzed dimensions. The accuracy of the method was verified by means of the Bartlett and Kaiser-Meyer-Olkin (KMO) test as it allows the testing of the factor analysis adequacy in the context of the collected data. The obtained value of the test (i.e. KMO=0.895, Sig.=0.000) indicated the adequacy of using the method for the present research. That being the case, a principal components extraction was unfolded, employing the varimax orthogonal rotation which maximizes the variance of the factor components and, thus, ensures a smaller loading of indicators on every factor. The analysis brought to the fore seven factors comprising 54.40% of the information embedded in the original set of data (Table 1).

Table 1: Total variance explained for the first extraction

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	7.397	24.658	24.658
2	2.729	9.095	33.754
3	1.533	5.111	38.864
4	1.373	4.578	43.442
5	1.204	4.013	47.455
6	1.051	3.502	50.957
7	1.034	3.445	54.402
8	.958	3.192	57.594
9	.932	3.108	60.702
10	.879	2.931	63.633
11	.825	2.751	66.383
12	.802	2.674	69.057
13	.720	2.399	71.457
14	.689	2.296	73.753
15	.671	2.236	75.989
16	.655	2.184	78.173
17	.601	2.004	80.177
18	.588	1.959	82.136
19	.576	1.920	84.056
20	.544	1.815	85.870
21	.514	1.715	87.585
22	.500	1.668	89.253
23	.474	1.580	90.833
24	.465	1.552	92.385
25	.438	1.461	93.846
26	.417	1.390	95.236
27	.386	1.288	96.523
28	.357	1.189	97.713
29	.350	1.166	98.878
30	.337	1.122	100.000

In accordance with the statistical requirements pointed out by Costello and Osborne (2005, p. 3), as three out of the seven identified factors had less than three indicators or their item loadings were below the threshold of 0.30, a second extraction of the main components was performed by limiting the number of factors to 4. At this level, ten items were dropped from the analysis. The structure of each factor in terms of the initial variables is presented in Table 2.

Table 2: Composition of the 4 factors extracted

Factor 1 Rational Knowledge	Factor 2 Emotional Knowledge	Factor 3 Spiritual Knowledge	Factor 4 Entropic Knowledge Dynamics
Q1=0.799	Q8=0.770	Q13=0.728	Q19=0.556
Q2=0.743	Q9=0.707	Q14=0.800	Q20=0.643
Q3=0.741	Q11=0.814	Q15=0.864	Q22=0.607
Q6=0.735			Q23=0.532
			Q24=0.429
			Q25=0.624
			Q27=0.700
			Q28=0.654
			Q29=0.563
			Q30=0.492

The items inclusion in one of the four dimensions and the results from the descriptive statistics are presented in Table 3. For all the variables, the minimum value is 1, and the maximum value is 5.

Table 3: Descriptive statistics

Item number	Variables	Factor	Mean	Std. Dev.
Q1	I always consider evidence-based arguments as a MUST when making a decision.	Factor1	3.91	0.72
Q2	I consider that good solutions rely on objective step-by-step analyses.			
Q3	Successful decision making depends on rational thinking.			
Q6	For me, knowledge used in decision making should be objective and rational.			
Q8	I believe that my perceptions help me provide good solutions to different problems.	Factor 2	3.59	0.77
Q9	I always trust my feelings when making decisions.			
Q11	I believe that my emotional intelligence has led me to good decisions.			
Q13	I believe that cultural values help me in making good decisions.	Factor 3	3.88	0.52
Q14	I have always a positive attitude when confronting with difficult tasks.			
Q15	I believe that sharing the same values with my team colleagues is important in solving group problems and projects.			
Q19	My intuition generates many good ideas.			
Q20	When I have a strange feeling about a situation, I analyze all the data more systematically.			
Q22	I often analyze external data through my personal experience and expectations.			
Q23	I often share the lessons learnt with my team members in order to			

Item number	Variables	Factor	Mean	Std. Dev.
	ensure a common approach on the issue.			
Q24	By analyzing the results of my decisions, I learn what is good or bad in similar situations.			
Q25	My personal values guide me in interpreting data and making decisions.	Factor 4	4.20	0.71
Q27	I often express my feelings openly in order to be better understood by my work team.			
Q28	I am open to other people's values when working together.			
Q29	Working with people sharing the same values and principles makes me feel comfortable in making decisions.			
Q30	The existence of a positive climate within the team makes me feel more enthusiastic towards future collaborations.			

The preliminary analysis of the descriptive statistics of the four factors shows that Emotional Knowledge has the lowest average mean ($M_{Factor2}$=3.59, SD=0.77), indicating that the respondents rely less on their perceptions, feelings and emotional intelligence when making decisions in comparison with sharing similar values and positive attitudes ($M_{Factor3}$=3.88, SD=0.52) or with evidence-based, objective step-by-step analyses and rational thinking ($M_{Factor1}$=3.91, SD=0.72). The highest average mean pertains to the Entropic Knowledge Dynamics, thus, supporting the importance attached by respondents to knowledge transformations and interactions ($M_{Factor4}$=4.20, SD=0.71). In this respect, the first research hypothesis - H1: When making decisions, students capitalize the entropic knowledge dynamics more than rational, emotional or spiritual knowledge taken separately - was confirmed.

In order to test the second hypothesis - H2: There are significant differences between undergraduates and graduates regarding knowledge-based decision-making processes - Independent-Sample T tests were performed to see whether there are meaningful differences on the four factors between undergraduates and graduates. As for all four tests Sig.>0.05, the data indicated that there are no statistically significant differences between the two categories. This situation points to the fact that the education level does not account for a significant change in how subjects rate the knowledge fields as predictors of the decision-making processes. Hence, the second hypothesis was not supported by the empirical data.

In order to deepen the analysis, further tests were applied using faculty year as a criterion, thus, allowing to support or not the initial results. The operation was meant to bring forth a clearer insight into the students' approaches by focusing on their actual status. Four groups were delineated, namely first-year, second-year and third-year undergraduates and first-year graduates.

In this front, an analysis of variance - One-Way Anova (i.e., Levene statistic test of homogeneity of variances) - was used to test whether there are significant differences regarding the knowledge fields and dynamics across the mentioned groups. The findings indicated statistically significant differences in respect of three out the four dimensions, that is Rational Knowledge, Spiritual Knowledge and Entropic Knowledge Dynamics. No significant differences were found in the case of Emotional Knowledge.

Focusing on the Rational Knowledge dimension, significant differences were retrieved among the groups of subjects - $F(3,398)=2.861$, $p<.05$. For instance, third-year students value rational thinking and decision-making most (m=4.02, sd=0.63), followed closely by master students (m=3.98, sd=0.66). Second-year students come forth as the least fond of using rational knowledge in their decisions (m=3.77, sd=0.88).

In what concerns the Spiritual Knowledge dimension, the results indicated the existence of meaninful differences, as well ($F(3,398)=11.325$, $p<.001$). At this level, the third-year and master cohorts reported the highest scores (m=4.36, sd=0.58, respectively m=4.37, sd=0.49) while the lowest score was retrieved in the case of second-year cohort (m=3.86, sd=0.87). This implies that the more experienced subjects value to a greater extent the influence of cultural values on making good decisions, the preservation of a positive

attitude when confronted with difficult tasks and the sharing of the same values with the team in solving collective-centric problems.

The same situation applies when analyzing the findings on the Entropic Knowledge Dynamics dimension ($F(3,398)=13.983$, $p<.001$) in that third-year and master students are at the forefront of transforming and integrating various knowledge fields in the decision-making processes ($m=4.01$, $sd=0.42$, respectively $m=3.98$, $sd=0.34$). Consistent with the results, these cohorts majorly appreciate the role of intuition on the emergence of multiple good ideas, using both emotions and cognitions in devising feasible solutions. At the same time, they extract relevant information from their own experiences when faced with new challenges and are willing to share the lessons learnt and best practices with their peers more than their younger counterparts. They are more open and eager to facilitate a positive climate when working in teams and accept the variety of the team members' values.

By corroborating these considerations, it can be affirmed that the third hypothesis - H3: There are significant differences across the student cohorts according to the faculty year criterion – was partially confirmed through three out of the four knowledge dimensions.

Going beyond an incremental division of the respondents in terms of education level and faculty year, the fourth hypothesis of the study – H4: There are significant differences between the male and female students regarding the knowledge-based decision-making processes – is meant to address potential gender variations. In this vein, Independent-Sample T tests were performed to see whether there are meaningful differences on the four factors between males and females.

As the results posit, $Sig.>0.05$ for all four tests, therefore there are no statistically significant differences between the two categories. As a consequence, the fourth research hypothesis was not supported by the empirical data.

4. Conclusions, limitations and future research directions

Education emphasizes on rational decision making which means to consider knowledge as being rational and objective. Knowledge management theory and practice enlarged that vision by introducing tacit knowledge as a complementary component to explicit knowledge. The Nonakian knowledge dynamics capitalizes on that dyad composed of tacit and explicit knowledge and shows that decision making depends on both components. However, the fuzzy structure of tacit knowledge and its organizational stickiness makes difficult the analysis of decision making processes in terms of explicit and tacit knowledge.

This being the case, the present paper introduces the multifield theory of knowledge, based on the energy metaphor for knowledge. According to this new paradigm, knowledge is a spectrum of three fundamental fields: rational knowledge, emotional knowledge, and spiritual knowledge. These fields are interacting such that each form of knowledge from any given field can be transformed into another form of knowledge. In this novel conceptual framework, decision making is not a pure rational process but it is a result of contributions coming from rational knowledge, emotional knowledge and spiritual knowledge, as well as from the entropic dynamics of these fields of knowledge.

In order to test these ideas, a research has been designed to reveal the influence of different fields of knowledge and their entropic dynamics on the decision making process. The research is focused on investigating how people make decisions with respect to the factors mentioned above, by means of a questionnaire-based survey addressed to students in management and business administration from two important universities.

The exploratory investigation availed the answers to the research questions formulated at the beginning of the paper, namely: RQ1: Are there any differences in the capitalization of knowledge fields when people make decisions?; RQ2: To what extent is the entropic knowledge dynamics important to people when making decisions?; RQ3: Are the subjects' socio-demographic characteristics relevant in the capitalization of knowledge fields when people make decisions? In line with the findings, there are differences among the importance attached to the four dimensions while the entropic knowledge dynamics – integrating active transformations and interactions between rational, emotional and spiritual knowledge – is most valued by the

questioned college students, be they undergraduates or graduates. Nevertheless, from a bird's eye view, all the factors were deemed important as all the average means exceeded the neutral threshold (i.e., 3).

Further, the analysis brought to the fore the fact that neither the education level (undergraduate versus graduate), nor gender account for statistically significant differences among the student cohorts. The situation is different when shifting the attention towards a new criterion, namely the faculty year. The application of the One-Way ANOVA test highlighted supported the existence of meaningful differences among the groups regarding the knowledge fields and dynamics, with the exception of the Emotional Knowledge dimension. At this level, third-year and master students value the rest of the considered dimensions more than their counterparts.That being the case, at a broader level, the study brings forward evidence in favor of the multifield theory of organizational knowledge, that is, the fundamental fields of knowledge are in a continuous interaction, and knowledge from each field can be transformed into knowledge of any other field. Linking the findings with the decision making process in the case of students, it becomes clear that most decisions result from the conversion and blending of two or more knowledge types. Consequently, pointing to one-dimension knowledge (i.e. rational knowledge) in the equation of good decisions is not a pertinent approach anymore.

As any other study, the present one has several limitations which should be thoroughly addressed in future research undertakings.

The first limitation refers to the sample structure which includes students from only two programmes of study (i.e., management and business administration) and from two Romanian universities. Further investigations on different samples (i.e., managers, entrepreneurs, etc.) would yield overall benefits and may reveal new aspects which could not stem from students' ratings. For instance, in a very competitive business environment, decision making is always under a huge time pressure and the entropic knowledge dynamics may play an even more important role.

The second limitation is linked to the mainly exploratory nature of the current research. In this sense, new and more complex analyses are necessary to reveal the influence of knowledge dynamics on the decision-making process. For example, the advancement of a structural model assessing the relationships between the four knowledge dimensions and the inclusion of mediating factors as organizational culture or climate would provide cogent insights into the overall dynamics of the knowledge fields.

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