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Edited by
Dr Ettore Bolisani
Dr Eleonora Di Maria
Dr Enrico Scarso

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(ECKM 2018)

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The Influence of Knowledge Dynamics on the Managerial Decision-Making Process

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Abstract: Research on the decision-making process in economics and management has focused mostly on the rational or intuitive thinking, ignoring the influence of knowledge dynamics. The most known models of decision-making are based on the hypothesis that action is a consequence of a rational choice. Since managers do not dispose of complete information and knowledge in most practical situations, the decision-making models incorporate a bounded rationality approach and a probabilistic thinking. There is also a stream of research showing that decision-making is based on individual experience of managers, experience which is filtered and structured as intuition. Many managers consider themselves intuitive decision-makers, especially in those domains of activity where the time is critical and there is no practical value of using the rational constructed decision-making models. The purpose of this paper is to bring into analysis a new perspective, which is based on the multifield theory of organizational knowledge and the entropic knowledge dynamics model. Cognitive scientists demonstrate that decision-making is neither a full rational process, nor a full intuitive one. It is a complex thinking process which is based on the contribution of rational, emotional and spiritual knowledge, and on their continuous dynamics. Based on the energy metaphor, the organizational knowledge can be conceived as a spectrum of rational, emotional and spiritual forms of knowledge. Our research aims at evaluating the relative influence of the knowledge dynamics on the decision-making process as compared to the bounded rationality and intuition dimensions, setting the premises for an integrative and multi-factor conceptual and structural model. The qualitative component of our research focuses on critical analysis of the literature background and identifying the key factors in the decision-making process, while the quantitative component is based on a research model composed of seven factors and eight inferred relationships, on processing data obtained from 138 questionnaires distributed online to middle and top managers from over 100 companies. The results obtained so far confirm the importance of the entropic knowledge dynamics within the complexity of the managerial decision-making processes.

Keywords: decision-making process, knowledge dynamics, bounded rationality, intuition, rational knowledge, emotional knowledge, spiritual knowledge

1. Introduction

Decision-making in business and economics is a very complex process which is based on both rational and non-rational variables. Traditional university education emphasized the rational approach, based on economic principles and mathematical modeling (Glaser, 2002; Goodwin and Wright, 2004; Sterman, 2000), while the new behavioral economics introduces new variables coming from cognitive sciences and strategic thinking (Baron, 2000; Blake, 2008; Branson, 2011; Goleman, 1995; Kahneman, 2011; Spender, 2014). According to these new findings, there are two modes of thinking: intuitive and reflective. In the intuitive system, the dominant variables are emotional and they are determined by our direct experience with the real world. In the reflective system, the dominant variable is rationality and thinking is logic, slow, and deliberate (Hallen and Pahnke, 2016; Kahneman, 2011; Kahneman et al., 2011). The two systems interact continuously and complement each other. This interaction is mediated by the knowledge dynamics since any decision-making is based on information and knowledge processing. However, the literature focusing on the role played by knowledge dynamics in decision-making processes is rather scarce and based on the explicit and tacit knowledge (Davenport and Prusak, 2000; Nonaka, 1994; Nonaka and Takeuchi, 1995). Explicit knowledge represents that part of the personal knowledge that can be expressed and transferred by using a natural or symbolic language. Tacit knowledge is more difficult to explain since it is born during our direct experience with the environment (Baumard, 1999; Becerra-Fernandez and Sabherwal, 2010; Polanyi, 1983). "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" (Nonaka and Takeuchi, 1995, p. 8). The whole theory of

knowledge dynamics based on explicit and tacit knowledge developed by Nonaka (1994), and Nonaka and Takeuchi (1995) is limited by the iceberg metaphor used, the cultural web, and the reversibility accepted in the SECI process (Bratianu, 2010; Glisby and Holden, 2003). The present paper extends the semantic of knowledge dynamics to the multifield theory of knowledge (Bratianu, 2015) which is based on the energy metaphor of knowledge (Bratianu and Andriessen, 2008) and considers three forms of knowledge as fundamental: rational knowledge, emotional knowledge, and spiritual knowledge. In this context, our research question is the following:

RQ: What is the relative influence of knowledge dynamics, based on the multifield theory of knowledge, on the decision-making process, with respect to bounded rationality and intuition?

By advancing this research question, the current study goes beyond the extant literature which mostly addressed one-sided perspectives on the relationship between knowledge and decision-making and sets the premises for an integrative model. The envisaged conceptual framework takes into consideration a multi-factor model liable to account for the knowledge dynamics and the variation of the decision-making process.

In order to find out an answer to this question, we performed an empirical research based on a quantitative approach. We addressed an online questionnaire to more than 200 managers from over 100 firms in Romania, and finally received 138 valid full answers. We processed them by using SPSS, version 20. The structure of the paper is designed as follows: theoretical background, research methodology, results and discussions, and some final conclusions to our research.

2. Theoretical background

Decision-making is a fundamental cognitive process, related to thinking (Baron, 2000), by means of which we choose among several possible actions in a context of uncertainty (Serrat, 2017). As March (1994, p. 1) emphasizes, "By far the most common portrayal of decision-making is one that interprets action as rational choice". However, decision makers do not have all necessary information and knowledge about the possible choices and about possible consequences for each of these choices. For a real context of decision-making, Simon (1997) introduced the concept of "bounded rationality". Most of the decision-making theories in economics and business today apply the *bounded rationality* concept (Güth and Kliemt, 2017; Lodge and Wegrich, 2016; Takahashi, 2015). Within the framework of bounded rationality, managers are searching for the "good enough" solution and not for the "best possible" solution since they are limited in their search by incomplete information and insufficient capability of performing exhaustive analyses of all possible alternatives with all possible consequences (March, 1994).

If decision-making based on bounded rationality is a *reflective* process, then decision-making based on our direct experience is an *intuitive* one (Kahneman et al., 2011). Klein (2003, p. xiv) defines intuition as "the way we translate our experience into action. Our experience lets us recognize what is going on (making judgments) and how to react (making decisions)". Thus, intuition acts as a pattern recognition process. In an excellent synthesis, Simon said that "Intuition is nothing more and nothing less than recognition" (cited by Kahneman, 2011, p. 237). Tacit knowledge acquired through direct experience is stored in our brain and body and is explored continuously in decision-making for finding similar facts or situations. Gladwell (2005, p. 24) metaphorically calls this process the "thin-slicing" theory: "Thin-slicing refers to the ability of our unconsciousness to find patterns in situations and behavior based on very narrow slices of experience". While bounded rationality mediates the influence of explicit or rational knowledge on the decision-making, intuition mediates the influence of tacit knowledge, especially of its emotional component. This framework of explicit-tacit knowledge based on the iceberg metaphor has a limited power on explaining the decision-making process.

A new perspective has been formulated by Bratianu and Andriessen (2008) and detailed by Bratianu (2011) with the energy metaphor for knowledge. According to this metaphor, knowledge is considered as a field composed of three fundamental forms of knowledge: rational, emotional, and spiritual. Each form of knowledge can be transformed into another form, generating an *entropic knowledge dynamics*. Entropy (Georgescu-Roegen, 1999) is used to emphasize the irreversibility of knowledge transformations. This entropic knowledge dynamics is revealed by cognitive sciences (Akügn et al., 2012; Damasio, 1999; Fowlie and Wood, 2009; Hill, 2008; Kahneman, 2011) and we consider that it is fundamental in any decision-making process. *Rational knowledge* is equated in knowledge management (Becerra-Fernandez and Sabherwal, 2010; Davenport and Prusak, 2000;

Nonaka and Takeuchi, 1995) with explicit knowledge and is a result of rational thinking. For many centuries rational knowledge was considered as being the only form of knowledge due to its objectivity. As Russell (1972, p. 153) explained it, "Knowledge consists in reflection, not in impressions, and perception is not knowledge". *Emotional knowledge* is a result of emotions and feelings (Damasio, 1999; Ekman, 2003; Goleman, 1995; Mayer et al., 2004) and appeared in knowledge management under the umbrella of tacit knowledge (Nonaka and Takeuchi, 1995). Emotional knowledge is "wordless knowledge" which emerges mentally as feeling of knowing (Damasio, 1999, p. 26). *Spiritual knowledge* reflects our understanding about the meaning of our life and work (Bratianu, 2015; Zohar and Marshall, 2000). It contains values which we share while working together and which become essential in guiding decision-making. Spiritual knowledge is important in creating a corporate social responsibility and developing sustainable competitive advantage (Bassu and Palazzo, 2008; Branson, 2011; Pinto et all., 2008; Wang et al., 2011). Considering the whole spectrum of knowledge, the entropic knowledge dynamics covers the core of the mental process of decision-making, while bounded rationality and intuition appear as limiting aspects. We start in our research with this observation and we would like to find out the relative importance of the knowledge dynamics in decision-making by comparison with bounded rationality and intuition.

3. Research design

Starting from the previous theoretical developments, six research hypotheses were formulated, as follows:

H1: There is a positive correlation between rational knowledge and decision-making.

H2: There is a positive correlation between emotional knowledge and decision-making.

H3: There is a positive correlation between spiritual knowledge and decision-making.

H4: There is a positive correlation between knowledge dynamics and decision-making.

H5: There is a positive correlation between intuition and decision-making.

H6: There is a positive correlation between bounded rationality and decision-making.

The research design relied on the measurements and assessments of seven conceptual dimension, considered as factors within the scope of the current study. Hence, the main measures examined in the empirical section integrate the following factors: rational knowledge (RK), Emotional knowledge (EK), Spiritual knowledge (SK), knowledge dynamics (KD), bounded rationality (BR), Intuition (IN), and decision-making (DM). Each of the seven latent variables was described via at least five items and constructed a questionnaire including 37 items constructed as assertions. 138 managers from different Romanian companies were invited to evaluate these assertions by using a Likert scale with five options, starting from 1 (Strongly disagree) to 5 (Strongly agree). In addition to the core items of the research, the socio-demographic items were intended to scrutinize the general profile of the respondents and of the represented companies, namely: age, gender, education level, position in the organization (respondents' coordinates) and the organizations' specificity in terms of field, core activity, size and turnover. The distribution of the questionnaire was facilitated by a manager working for a consulting company who had access to a large database of companies and subjects relevant for the focus of the study.

The research was conducted between January 10 and March 12, 2018. By the end of this period, 138 valid questionnaires were retrieved. The sample was considered large enough to process the data by using SPSS software (version 20) and to derive meaningful results. An exploratory factor analysis was performed in order to analyze the factors and to ensure a clear measure of the targeted dimensions. The structure of the statistical population brought to the fore the following features: the great majority of subjects (42%) are aged between 25 and 34 years old, followed by the subjects aged between 35 and 44 years old (29%), the sample comprising 59.4% females and 40.6% males; most of the respondents (73.2%) have a master's degree, occupy a middle management position (50.7%) and act in the services sector (74.6%). In what concerns the key information referring to the selected companies, most of them (68.1%) have over 249 employees and have a turnover of more than 11 mil. Euro (63.8%).

4. Results analysis and discussion

The statistical analysis of the collected data was based on seven main conceptual pillars referring to the theoretically discussed dimension, as previously mentioned: *Rational knowledge, Emotional knowledge, Spiritual knowledge, Knowledge dynamics, Bounded rationality, Intuition, Decision-making.* The factor analysis facilitated the identification of the most significant factors able to pertinently describe the parameters of the

population. The accuracy of the method was checked by employing the Bartlett and Kayser-Meyer-Olkin (KMO) tests (Table 1). The KMO test allowed the determination of the efficiency of the application of factor analysis in the case of the current data. A small value of the KMO test (i.e., less than 0.7) would indicate the inadequacy of using this particular method, whereas a large value of the test, converging to one, supports the application of the method to sum up the information comprised in the variables. Both the Bartlett test and the KMO test suggested a very good accuracy for using the factor analysis for the present research.

Table 1: KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.777
Bartlett's Test of Sphericity	Approx. Chi-Square	1948.509
	df	666
	Sig.	.000

To perform the factor analysis, we started with the principal components extraction (Costello and Osborne, 2005), applying the varimax orthogonal rotation. This specific rotation maximizes the variance of the factors components, leading to a smaller loading of variables onto every factor, and making the interpretation of the identified factors more pertinent. Hence, using the varimax orthogonal rotation, seven identifiable factors comprising 54.19% of the information embedded in the original set of data were retrieved (Table 2).

Table 2: Total variance explained for the first extraction

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.969	21.537	21.537	7.969	21.537	21.537
2	4.071	11.003	32.540	4.071	11.003	32.540
3	1.903	5.144	37.684	1.903	5.144	37.684
4	1.719	4.645	42.330	1.719	4.645	42.330
5	1.561	4.220	46.550	1.561	4.220	46.550
6	1.456	3.935	50.484	1.456	3.935	50.484
7	1.370	3.702	54.186	1.370	3.702	54.186
8	1.133	3.061	57.247			
9	1.121	3.031	60.278			
10	1.018	2.751	63.029			
11	.971	2.624	65.653			
12	.884	2.389	68.042			
13	.868	2.346	70.387			
14	.805	2.175	72.562			
15	.781	2.111	74.673			
16	.755	2.041	76.714			

A Cronbach alpha coefficient test was conducted on all seven factors to test the reliability of all of the item variables. This was to determine the internal consistency of the scale used. The test results indicate higher values than 0.65, proving a good internal consistency. The items inclusion in one of the seven categories and some significant 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

Indicator	Item	Factor	Mean	Standard Deviation
RK1	I use to take action starting from objective, evidence-based arguments.	Rational Knowledge (Factor 1)	4.12	0.80
EK1	My perceptions help me provide good solutions to different business problems.	Emotional Knowledge (Factor 2)	4.05	0.8
SK1	Having strong social values helped me in my business.	Spiritual Knowledge (Factor 3)	3.99	0.72
IN1	I often have a feeling if something will go well or badly in a business context.	Intuition (Factor 5)	3.65	0.84
KD1	Whenever I have a strange feeling about a situation, I analyze the data more systematically.	Knowledge Dynamics (Factor 4)	4.34	0.81
BR1	Business decisions are often made having limited knowledge of the overall factors.	Bounded Rationality (Factor 6)	3.01	1.15

Indicator	Item	Factor	Mean	Standard Deviation
DM1	Most of my business decisions proved to be appropriate.	Decision-Making (Factor 7)	3.75	0.65
RK2	I consider that good solutions rely on step-by-step logical analyses.	Rational Knowledge (Factor 1)	4.14	0.80
EK2	I use to trust my feelings when dealing with different business issues.	Emotional Knowledge (Factor 2)	3.57	0.82
SK2	I use to adopt a positive attitude when I am confronted with difficult business tasks.	Spiritual Knowledge (Factor 3)	3.97	0.95
IN2	My intuition generates many good business ideas.	Intuition (Factor 5)	3.73	0.77
KD2	Whenever I collaborate with trustful business partners, I am very committed.	Knowledge Dynamics (Factor 4)	4.47	0.66
BR2	Business decisions are often made in uncertain contexts, thus having hard-to- control outcomes.	Bounded Rationality (Factor 6)	3.45	0.94
DM2	I have been often congratulated on my good business decisions by my team.	Decision-Making (Factor 7)	3.72	0.69
RK3	I analyze things in detail with respect to different business situations.	Rational Knowledge (Factor 1)	4.08	0.82
EK3	I trust my emotions when I am confronted with new business challenges.	Emotional Knowledge (Factor 2)	3.36	0.93
SK3	I am open to establish sustainable agreements with business partners sharing the same cultural values.	Spiritual Knowledge (Factor 3)	3.94	0.84
IN3	I find that 'too much analysis results in paralysis'.	Intuition (Factor 5)	3.14	1.05
KD3	I often analyze external data through my business experience and expectations.	Knowledge Dynamics (Factor 4)	3.88	0.77
BR3	I often have to manage different competing imperatives when exploring business solutions.	Bounded Rationality (Factor 6)	3.69	0.72
DM3	My business decisions often resulted in the firm's higher performance.	Decision-Making (Factor 7)	3.67	0.69
RK4	I do not get emotional when examining business issues.	Rational Knowledge (Factor 1)	3.2	0.99
EK4	The emotional intelligence has often proved useful in doing business.	Emotional Knowledge (Factor 2)	3.99	0.85
SK4	I use to collaborate with business partners who embrace the same business vision.	Spiritual Knowledge (Factor 3)	3.8	0.78
IN4	My style is more spontaneous action than cool deliberation.	Intuition (Factor 5)	2.99	1.06
KD4	I often share the lessons learnt with my business partners in order to ensure a common approach on the issue.	Knowledge Dynamics (Factor 4)	3.97	0.73
BR4	I am often confronted with a limited ability to control external factors in a business situation.	Bounded Rationality (Factor 6)	3.49	0.87
DM4	My business decisions often led to sustainable partnerships.	Decision-Making (Factor 7)	3.83	0.71
RK5	I rely on rational thinking when I am confronted with new business challenges.	Rational Knowledge (Factor 1)	3.92	0.75
EK5	I use to attach importance to the first impression in business.	Emotional Knowledge (Factor 2)	3.53	0.90
SK5	Good business is doing good for people.	Spiritual Knowledge (Factor 3)	4	0.86
IN5	I rely on my senses in many business situations.	Intuition (Factor 5)	3.57	0.85
KD5	I use to learn what is good or bad in different business situations by analyzing the results of my previous actions.	Knowledge Dynamics (Factor 4)	4.05	0.7
KD6	My personal values guide me in interpreting data and distinguishing between solutions.	Knowledge Dynamics (Factor 4)	3.98	0.74
BR5	Bounded rationality leads me to good enough solutions.	Bounded Rationality (Factor 6)	3.6	0.79
DM5	I am satisfied with the outcomes of my previous business decisions.	Decision-Making (Factor 7)	3.81	0.6

Indicator	Item	Factor	Mean	Standard Deviation
KD7	Working with business people sharing the same values and principles makes me feel comfortable.	Knowledge Dynamics (Factor 4)	4.3	0.64

On purpose to investigate the importance attached by the questioned managers to each of the seven factors, means and standard deviations were computed for each latent variable (Factor 1 – M=3.89, SD=0.57 , Factor 2 – M=3.70, SD=0.55; Factor 3 – M=3.94, SD=0.49; Factor 4 – M=4.14, SD=0.43; Factor 5 – M=3.41, SD=0.64; Factor 6 – M=3.45, SD=0.55; Factor 7 – M=3.76, SD=0.49).

The analysis of the descriptive statistics indicated that the subjects most value knowledge dynamics (M=4.14, SD=0.43) while resorting to sheer intuition in business situations is the least employed practice (M=3.41, SD=0.64). The computation of the factor means allowed the investigation of the relationships between the latent variables as inferred by the hypotheses. In this respect, a Pearson correlation coefficient (Hall, 2015) for scale variables was employed. The results are presented in Table 4.

Table 4: Correlations

		Decision-Making
Rational Knowledge	Pearson Correlation	.446**
	Sig. (2-tailed)	.000
	N	138
Emotional Knowledge	Pearson Correlation	.321**
	Sig. (2-tailed)	.000
	N	138
Spiritual Knowledge	Pearson Correlation	.502**
	Sig. (2-tailed)	.000
	N	138
Intuition	Pearson Correlation	.319**
	Sig. (2-tailed)	.000
	N	138
Bounded Rationality	Pearson Correlation	.322**
	Sig. (2-tailed)	.000
	N	138
Knowledge Dynamics	Pearson Correlation	.580**
	Sig. (2-tailed)	.000
	N	138

Correlation is significant at the 0.01 level (2-tailed).

Correlation is significant at the 0.05 level (2-tailed).

The analysis of the first hypothesis - H1: There is a positive correlation between rational knowledge and decision-making – validated the existence of a significant positive relationship between the variables ($r=0.446$, $p<0.01$), a fact which supported that objective, evidence-based arguments and step-by-step logical analyses correlate with decision-making business processes to a great extent within the scope of the current research. Next, the examination of the second hypothesis - H2: There is a positive correlation between emotional knowledge and decision-making – displayed a similar situation in that there is a significant positive, yet moderate, relationship between the variables ($r=0.321$, $p<0.01$). This is indicative of the fact that emotional knowledge (including here the use of perceptions, feelings, emotional intelligence, first impressions when dealing with different business problems) and decision-making correlate in daily business practices.

The third hypothesis - H3: There is a positive correlation between spiritual knowledge and decision-making – shifted the focus towards the relationship between having strong social and cultural values, positive attitudes and visions and making good decisions in business. In this front, the correlation coefficient ($r=0.502$, $p<0.01$) indicated a significant positive correlation between the considered variables. Further, the analysis of the relationship presumed by the forth hypothesis (H4: There is a positive correlation between knowledge dynamics and decision-making) brought to the fore the highest correlation among the latent variables ($r=0.580$, $p<0.01$), thus supporting the fact that knowledge transformations and combinations correlate with the decision-making processes and practices to a great extent in business frameworks. Thus, the managers who resort to both

systematical analyses and previous experiences, who rely on both personal values and objective facts are more likely to make efficient business decisions.

Conversely, the lowest correlation between variables ($r=0.319$, $p<0.01$) was reported when testing the fifth hypothesis (H5: There is a positive correlation between intuition and decision-making). Even though the significant positive correlation supported the influences between intuition and decision-making, the findings indicated that managers relying exclusively on their senses and context-driven feelings may have good results in performing their business activity, but to a lower degree than the ones who resort to multifield knowledge. A similar correlation coefficient was retrieved in the case of the sixth hypothesis (H6: There is a positive correlation between bounded rationality and decision-making) ($r=0.322$, $p<0.01$). Hence, the results supported the moderate relationship between bounded rationality (i.e., having limited knowledge of the overall business factors, limited control on external factors and competing imperatives) and decision-making business processes.

5. Conclusions

The investigation of the relative influence of knowledge dynamics, based on the multifield theory of knowledge, on the decision-making process brought forward meaningful relationships among the advanced constructs. All six hypotheses were supported by the empirical research, thus validating the theoretical developments who sustained the influences between rational, emotional and spiritual knowledge and decision-making, knowledge dynamics and decision-making, intuition and bounded rationality and decision-making. As shown by the findings, the highest correlation between variables was retrieved for the dyad knowledge dynamics and decision-making, a fact which confirms the approach of Bratianu (2015) in terms of the multifield theory of knowledge and the inherent transformations. Also, the study adds up to the extant literature by supporting the complexity of the decision-making process which surpasses monolithic inputs and depicts multilevel variations.

The results have implications for both academia and practice. In what concerns the former, the findings open up a new research avenue for understanding and investigating the relationship between the knowledge span and decision-making, by supporting the existence of multiple influences. As for the latter, decision makers should acknowledge the fact that good decisions rely on a manifold approach which simultaneously integrates various types of knowledge, intuition and the bounded rationality.

Nevertheless, as any other research, the present one would benefit from further improvements. On the one hand, a further development of the constructs and of the inferred relationships among them would better clarify the scope and focus of each concept and theoretical model and would refine the general overview. On the one hand, as this particular investigation is part of an ongoing survey, an extended version of the paper would comprise a more in-depth analysis of the described phenomena. The extension of the sample on more organizations would allow processing the data by employing a structural equation modeling technique able to genuinely depict the influences of each exogenous variable on the endogenous variable, that is, decision-making. This undertaking would provide a fresh insight into the knowledge realms and transformations, relying on relevant samples and compelling examinations.

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