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The Model of Entropy Value Theory for the Institutional Performance in Public Administration

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Abstract

The major transformations that the Romanian society is facing nowadays cannot but impose radical transformations, especially of the public management at all levels. In this article, we intend to apply value-based management adapted to decision making at all levels of development by public institutions. In order to understand the value phenomenon, both as an economic category of high complexity, as well as a social and cultural phenomenon, we propose to discuss the application of research methods appropriate to these events that make up the value phenomenon, but also to the behaviour of all systems involved in the mechanism of obtention and management of value. We propose the application of the general principles of the model of entropic value theory in the management of local public administration, at regional and national level.

Keywords: Value management, public management, transformation, entropy value theory model, value management.

JEL Classification: H83, P17

1. Introduction

Research and studies in the field of public policy are different from those of academic research in that they have an applied, oriented approach − firstly, towards designing and developing solutions for the problems of society − public policy is not limited to researching these problems, but it also has the role of issuing solutions

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in which they are to be applied, secondly – towards bringing arguments based on assumed values. The complex process of carrying out public policies and offering alternatives – these are exercises that are about skills, capacities and we do not judge performance.

2. Priority Issues in the Field of Public Management

In order to be able to build a modern public administration oriented towards the beneficiaries of public services, an open administration and receptive to innovative solutions, which simplifies and consolidates institutions and mechanisms, we need methodological and theoretical support. The discussions about the reform of the public administration in Romania give rise to some confusion regarding the meaning of this expression. Specifically, reform means more than improving administrative capacity. In short, the answer is that these are two different concepts of public sector organization (Profiroiu et al., 4).

In many countries of the world, there have been transformations in the field of public management. As confirmed by an author (Androniceanu, 2007, 2): *"In the United Kingdom, Australia and New Zealand were implemented the first major changes in public management from the perspective of the value system known in the Romanian and foreign specialized literature under the name of the New Public Management (NMP). The New Public Management (NMP) brings together values that shift the focus from traditional public administration to public management (Lane, 1994). The traditional model of organization and provision of public services, based on principles such as bureaucratic hierarchy, administrative planning, centralization of the decision, direct control and economic independence, are replaced by a management of public services based on a direct relationship with the market"*.

According to the author Gerrit van der Waldt (2014): *"as a subject of applied social sciences, public administration is a diversified field with fast evolutions. Simultaneously with the emergence of the production mode - knowing the model, the achievement increases the complex social challenges that cannot be accompanied by singular disciplinary perspectives."*

In the Uwizeyimana's (2017) opinion: "*The problems facing administrative systems are becoming increasingly complex, and a known subject to focus on is understanding how administrative systems are the government function and preparing people to work in such systems to promote efficiency and effectiveness. Facing the challenge of complexity".* The subject of Public Administration must be able to produce graduates who have the appropriate aptitudes, attitudes, competences and capacities to navigate the complex environment on which the service delivery is based at present. This challenge touches on a significant question, that is, whether it can produce knowledge from a single subject, for the right people. Some authors have previously accused the Public Administration of not being able to be a subject matter because of its "promiscuous" nature, as borrowed from many other subjects to build its knowledge base. Such an allegation is likely to persist because today's government issues cannot be solved by people - civil servants and politicians with a disciplinary focus.

According to Georgescu Roegen: "a specialist in the field of social sciences should feel much more attracted to arithmomorphism than any other researcher. We prefer to ignore the fact that no arithmetic model can present how the competition works or how the economic system turns into another, which does not mean that we are moving away from the dialectical nature of the economic process. Theoretical science is a living organism precisely because it emerged from an amorphous structure − taxonomic science − just as life appeared from inert matter. Moreover, as life does not appear anywhere where matter exists, so the theoretical science did not appear wherever there was taxonomic science: its genesis was a historical accident. Aspects of time in economic science. Economic activities are, first and foremost, the most important manifestation of time, far greater than our involvement in natural phenomena. Economic life is a unique process that began in historical times and in a disturbed environment." (Georgescu, 1996, p. 209).

3. The Model of Entropy Value Theory

The theory called the value theory based on the low entropy or Theory of the Entropy Value (TVE) will acquire paradigms changed from the current theories (The value theory - work, and the value theory utility) (Bran, 2003, p. 53).

Physical support of value. An important element for economic theories regarding value is the range of systems employed to obtain value. Former theories recognized a limited number of systems involved in the mechanism of obtaining and dimensioning value. The respective systems were limited to economic systems represented by the producer system and the consumer system. The phenomenal leap proposed by Professor Paul Bran is that in bringing in the mechanism of obtaining and managing value - the systems of the natural environment and of society.

In the author's opinion, the natural sciences have shown that life is due to substances that we encounter at every turn. Living organisms only maintain their life if they attract and transform low entropy from the primary elements of matter: the substance, the energy, the information.

Integrated into the natural circuit of matter, the living system of man is the beneficiary of a potential (low entropy), manufactured by the living and the nevi systems of Nature. Potential that allows us to exist, even if the processes we trigger in society and in the economy are very wasteful.

General principles of entropy value theory model construction. In the author's opinion, the correlation of the TVE model with the models of the other theories of value highlight the differences, but also the fact that the model of the value based on entropy encompasses the other models, leading to further knowledge, towards the real level of the conserved potential, as the value of the product obtained in t 1. (Bran, 2003, pp. 140-141).

Rethinking value management. Firstly, value management, economic potential at the societal level must consider both enhancing potential supply processes in the near or distant future and increasing the productivity of all processes involved in obtaining value. *Secondly,* the mechanism of attracting low entropy from the environment, processing and preservation must be endowed with new technologies that will increase the transformation efficiency, with the reduction in the specific consumption of substance S and E energy. This process submits the attracted inputs (Pn, Ps, Pes) to a transformation process according to the technology and the purpose of each type of enterprise.

$$\text{Potential } Pn + Ps + Pes = Pep + Ed \quad (1.1)$$

(Natural Potential – Pn, Social potential – Ps, Economic potential - Pes).

Through the process of transformation and then of preservation of the results of the transformation, a new degree of organization of the potential from the inputs in the form of a product is obtained, Pep, according to the specific rule of this process.

An original proposal is the introduction of the eco-field, force field concept (Bran, 2003, pp. 102, 108). The reform of the eco-field implies a radical transformation of the political, social and behavioural structures for all members of the society and, first, the driving factors at all levels. The form of existence of matter called "force field" is the organizer of the material phenomena around which it is formed. This aspect was elucidated in the case of the biological systems, being, in our opinion, valid also for the economic systems, such as the enterprise, the national and world economy. In the eco-field that surrounds the company, the main headquarters of the economic activity that we want to reform, the "reform matrix", which will organize the entire process of economic recovery, must be established. In the following stage of this paper we will present the discoveries of Pranghishvily (2003) in which the author rounded up the research on the subject of Entropy and Negentropy and their ecosystems.

Different forms of entropy (Pranghishvily, 2003, p. 18). At least four forms of entropy are found in the literature: 1. Entropy as the measure of the uncertainty of the state of any fully ordered physical system or the behaviour of any system, including living and non-living objects and their functions. 2. Thermodynamic entropy of micro particles or molecular (microscopic) sets. 3. Information entropy, or information uncertainty, reflects information about an information system. 4. Entropy, or behavioural uncertainty, of any unordered system up to macroscopic sets.

Negentropy. The famous French physicist, one of the creators of information theory, L. Brillouin, suggested that information equivalent to negative entropy should be called negentropy. The negative entropy of E. Schrödinger is fundamentally different from the negentropy of L. Brillouin. L. Brillouin and N. Wiener misinterpreted negentropy as anti-entropy or negative entropy (i.e., minus sign entropy).

Accounting for entropy (Pranghishvily, 2003, p. 25). Each system in the Universe contains, in addition to mass (substance) and energy, in an equivalent amount, their additional form of state is generalized negentropy.

The laws of energy-entropy balance for the reference point of the entropy of any living and lifeless system, one can take the most ordered state of the system when the entropy of the system becomes zero (E = Eo = 0).

The entropy and essence of I. Prigogine's theory (Pranghishvily, 2003, p. 36). Exceptional Belgian physicist and chemist, Nobel laureate Ilya Prigogine is the founder of the theory of irreversible processes of balance in nature and society. He showed that in external conditions that impede the state of equilibrium, the entropy increases, and if there are no obstacles, the entropy reaches an absolute minimum (zero). I. Prigogine formalized these processes as follows: the entropy of a process of equilibrium, or of a system of equilibrium, for n independent forces **x1, x2, ..., xn** is described by the expression:

$$E = \sum_{i,K} L_{iK} X_i X_k \tag{1.2}$$

where **Li, k** is a thermodynamic quantity that varies depending on the conditions. In addition, he proves that if Xi is constant, then for: ΔE / ΔdXi = 0 (i = 1 ... n) → min, and the total entropy flow will be equal to the absolute minimum

$$I_i = 0{,}5\,\frac{\Delta E}{\Delta X_i} = \sum L_{iK} X_K = 0. \tag{1.3}$$

The total entropy Prigogine function, in the general case of the continuous system, when i-e forces and entropy fluxes i are functionally dependent on the condition (points x) expressed by I. Prigogine through the function:

$$E_{\Sigma} = \int E(X)\,\Delta V = \sum_{iK} \int X_i\,(x) L_{iK} X_K(X) \Delta V \tag{1.4}$$

V − the volume of a non-equilibrium system. Local entropy flow, E (x) integrated with quantum information, so information in the same volume ΔV, as entropy. The example of thermodynamic systems demonstrates the theme of total entropy.

New entropy and the principle of new maximum entropy in management of A. Panchenkov. The monograph proposes a paradigm called by the author new entropy. According to A. Panchenkov (1999), entropy is traditionally interpreted in all works (foreign and native scientists) as a measure of negative quantity, as a measure of disorder, chaos and disorganization and structure imperfection. The new entropy introduced by the author of the book, unlike the traditional one, has a different, positive, fundamental meaning - as a measure of the perfection of the structure, a measure of order, organization and has a content similar to negative entropy (anti-entropy) or negentropy. Based on this, the proposed maximum principle of the new entropy considered as the maximum principle of anti-entropy or negentropy, in the traditional sense of entropy.

The entropy compensation principle (Pranghishvily, 2003, p. 39) when studying a specific open system (A1), you must take into account all other systems (the environment) that interact with it, conditionally combined in system A2. In this case, the general (or combined) system (A3) is considered closed or isolated, and for the A3 system the law of increasing entropy can be applied $\Delta E3 = \Delta E1 + \Delta E2 \geq 0$. Only in this case will the principle be true entropy compensation, which claims that within an isolated system, a drop in entropy in one system (-ΔE1) leads to an increase with the same (or slightly more) entropy in another system (+ ΔE2) or in the environment. Such an interaction maintains the balance of general entropy, that is. The principle of entropy compensation is realized.

The entropy approach to semantic (substantial) analysis of scientific information, (Pranghishvily, 2003, p. 41). If, using the entropy approach, according to K. Shannon, the information is analysed syntactically (quantitatively), then using the same entropy approach, the information is analysed at a more complex, semantic (substantial) level.

Entropy for the assessment of the state of the human body. (Pranghishvily, 2003, p. 46) Entropy is a measure of the probability that a system will remain in a certain state. Entropy is one of the fundamental properties of any system with probabilistic behaviour, offering new levels of understanding in coding information, system analysis, linguistics, biology, image processing, etc. The influence of external information on a system is estimated by changing the entropy of the system state.

Calculation of entropy for the monitoring and management of the project of modernization of the installation. (Pranghishvily, 2003, p. 47). The entropy models and the entropy calculations, besides the problems of thermodynamics and statistical physics, are beginning to practically apply in computer science, economics, project management and organizational structures, etc.

The quantity of information in the project is determined

$$I_p = -\sum \Psi (p) \, 1n\Psi (p), \tag{1.5}$$

p which coincides with the entropy E of the set G. This quantity determines the amount of information that the manager must face in the project management process. The quantity Ψ (p) is a measure of probability in the state-space of the project. The use of this formula to determine the amount of information from a project (I_p) in the risk management tasks in complex projects and to determine the entropy, performed according to the following algorithm. The first step is to consider project planning from a classical perspective. Furthermore, the entropy (E) of the project is the sum (E_{ID}) of each work, where the ID is the identifier of the work,

That is $E = \sum_{ID} E_{ID}$ (1.6)

At the second step of the calculation of the entropy E, of the work, the multitude of adverse, unfavourable events is determined. In the second stage, many adverse events are determined to calculate the entropy of E_{ID} work. ID - identifying the type of work activity. An example of a working program with the following parameters, presented early finishing (EF), late finishing (LF) and worst finishing

$$[EF + (d_u - d)] \tag{1.7}$$

in the case of an *indefinite duration* di <d <du, *where d is the duration, a du is the maximum possible duration*. Adverse events occur when work enters the critical path with a negative one.

The shaded segment E_I = [LF, EF + (d_i-d)] (1.8)

represents many adverse events. In the third stage, the set of adverse events I in case of a negative time reserve is defined as:

a) E_i= 0, if there is no uncertainty (1.8.1)

b) E_i = [LF, EF + (d_u-d)] if LF > EF > + (d_i - d), (1.8.2)

c) E_i= [EF + (d_i - d), EF + ($d_u$du + d)] if LF < EF + $(d_i - d)$ (1.8.3)

In the simplest case, the duration δt is evenly distributed in the range (di, du). The probability of Pi, for the duration of the work to take the value (d_i, d_i + δt), is Pi = δt (d_u- d_i), and the entropy of the work is determined according to the formula

I = −∑Ψ (P) 1nΨ (P). (1.9)

Example of work schedule indicating early finishing (EF), late finishing (LF) and worst possible finishing [EF + (du - d)]. In the sixth step, the individual entropy is determined:

$E_{ID} = -\sum_{E_u} P_i \ln P_i$ = - N_{E_u} $P_i$ln P_i = E_u /(d_u - d_i) ln P (1.10)

where Pi is the measure the probability of working to get it states this parameter, and the formula for the total entropy of the project plan, which is the sum of the individual entropies, has the form:

$E_{\sum} = \sum_{ID} E_{ID} = \sum_{ID} E_u/(\, d_u - \, d_i) \ln P = \sum_{ID} E_u/(d_u - d_i) \ln P,$ (1.11)

where the set of adverse events (E_u) is equal

E_u = [EF + (d_u- d) - LF] = [(d_u- d) −TF],

TF = LF - EF is the complete reserve. (1.12)

At the seventh stage, using the above formula (1.11), the chance opposite to the risk can be calculated, provided that the set of adverse events are replaced by the set of favourable events E_f (best possible end, late end), i.e. those events that give the work a positive margin in time and remove the work from the critical path. In order to determine the set of favourable events, it is necessary to use the index of the critical work CRIT (the probability that the work will reach the critical path). In the eighth stage, the entropy of other components of the project, such as cost, quality, specification, is calculated similarly.

The entropy value of each specific project shows how much information is required to work in a situation with uncertainty in process or probability. In other words, entropy shows the necessary power of the adoption system.

4. Conclusions

Entropy is a fundamental property of any system with ambiguous or probabilistic behaviour; therefore, it will be successfully applied in the management of public administration at all levels (national, regional and local).

It is known that any discrete sets, any objects and phenomena (systems) of animated and inanimate nature, without exception, contain features of order and disorder (chaos), certainty and uncertainty, organization and disorganization, and thus entropy. The value of entropy as a quantitative measure of uncertainty, unpredictability, disorder, chaos, disorganization of probabilistic systems is universal. Therefore, we must inevitably take into account the presence of entropy in the form of disordered, disorganizing, chaotic noise factors, in the behaviour of probability systems, in their elements and their interaction. Scientists from the beginning of the 20th century showed that we live in a world of not only molecular disturbance, but also in the world of macro-instability, and we have therefore adopted generalized entropy (GE) as a universal parameter - a quantitative measure of uncertainty or disorder.

One should account for Generalized Entropy (GE) and Generalized Negentropy (GNE) to improve the quality of system models and their calculation. An important part of abhorrence comes from the relationship between order and disorder in technology, nature and society, the laws of energy-entropy balance, the problems of entropy reduction and the process of self-organization of the system. The development of society on the path of self-organization and ordering or on the path of disorganization and chaos has entropic criteria. Due to these entropy criteria, a new mechanism for the emergence of environmental crises has been identified, which is not taken into account by modern environmental science. The conditions and limits of stability of a mixed economy are defined when the market consists of private and state capital. Perhaps the principle of coagulation of information due to the hierarchy is widely used by the brain in storing and implementing huge and numerous masses of information.

References

[1] Androniceanu, A. (2007). Noul management public [New public management] Online: http://ramp.ase.ro/_data/files/articole/8_05.pdf.

[2] Bran, F., Alpopi, C., & Burlacu, S. (2018). Territorial Development-Disparities between the Developed and the Least Developed Areas of Romania. *Lumen Proceedings*, 6(1), pp. 146-155.

[3] Bran, P., (1993). Reforma economică la români, [Economic reform for Romanians], *Revista Economica ASEM*, 3, pp. 17-24.

[4] Bran, P. (2003). Economica valorii, [Value economics], ASE Publishing, Bucharest.

[5] Burlacu, S., & Jiroveanu, D. C. (2011). The Develope of Software Solution for Supply Chain Management. *Revista de Management Comparat International / Review of International Comparative Management*, 12(6), pp. 140-145.

[6] Burlacu, S., Gutu, C., & Matei, F. O. (2018). Globalization--Pros And Cons. *Quality-Access to Success*, 19.

[7] Costache, G., Marinas, C. V., Igret, R., & Burlacu, S. (2015). Internship in the Hr Department – Organizational and Individual Perspectives. *In Proceedings of the International Management Conference*, 9(1), pp. 359-370.

[8] Georgescu, R. N. (1996). *Epistemologia roegeniană*, [Roegenian epistemology] coord. Aurel Iancu, Opere complete, VII, Expert, Bucharest.

[9] Gerrit, van der Waldt, (2014) Public Administration and transdisciplinary: a modalistic approach toward knowledge construction, *International Journal of Humanities and Social Sciences*, 32(3) SAGE, pp. 14-20.

[10] Ionita, F., & Burlacu, S. (2009). Public Administration from Romania in the Knowledge Society and E-Learning. In *Proceedings of the Fifth "Administration and Public Management" International Conference: "Public Institutions' Capacity to Implement the Administrative Reform Process"*, Bucharest, June 23-24, 2009. No. 25.

[11] Ionita, F., Ursacescu, M., & Burlacu, S. (2009). Public Services as Poles of Regional Competitiveness in Sustainable Development. *Revista de Management Comparat International / Review of International Comparative Management*, 10(3), pp. 552-565.

[12] Ioniţă, F., Burlacu, S., & Gaidargi, A. (2009). Modern Approaches of the Management of Alternative Trade Systems, *Revista de Management Comparat Internațional / Review of International Comparative Management*, 51, pp. 473-480.

[13] Jianu, I., Dobre, I., Bodislav, D. A., Radulescu, C. V., & Burlacu, S. (2019). The Implications of Institutional Specificities on the Income Inequalities Drivers in European Union. *Economic Computation and Economic Cybernetics Studies and Research*, 53(2), pp. 59-76.

[14] Profiroiu, M., Andrei, T., Dinca, D., & Carp, R. (2012). Reforma administratiei publice in contextual integrarii europene, [Reform of public administration in the context of European integration], Online: http://beta.ier.ro/documente/studiideimpactPaisIII_ro/Pais3_studiu_3_ro.pdf.

[15] Profiroiu, M., Andrei, T., Dinca, D., Carp, R., (2016). Reforma administratiei publice în contextul integrării europene [Reform of public administration in the context of European integration], Institutul European din România – *Studii de impact*, III, Studiul nr. 3, p. 4.

[16] Rădulescu, C. V., Bodislav, D. A., & Burlacu, S. (2018). Demographic Explosion and It Governance In Public Institutions. *Managerial Challenges of the Contemporary Society. Proceedings*, 11(1), 18.

[17] Rădulescu, C. V., Dobrea, R. C., & Burlacu, S. (2018). The Business Management of Distress Situations. *The 12th International Management conference "Management Perspectives in the Digital Era"*, November 1st-2nd, 2018, Bucharest, Romania, 1, pp. 741-747.

[18] Uwizeyimana, D., E., (2017). The Multidisciplinary, Interdisciplinary and Transdisciplinary Nature of Public Administration A Methodological Challenge? *Article*, December 2017.

[19] Panchenkov A. I. (1999). *Entropy*. Nijnii Novgord: Interservis, 1999.

[20] Pranghishvily, I. V. (2003). Энтропийные и другие системные закономерности: Вопросы управления сложными системами, [Entropy and other systemic patterns: Issues of managing complex systems], *Rossiiskaia akademia nauk*, http://apolovoleg.narod.ru/olderfiles/1/PrangishviliI.VJEntropiinyeidr-88665.pdf.

[21] Iurin G. G. (2001). Energheticeskaia teoria ekonomiki jizni obscestva, [Energy theory of economics of life], World Bank Group, http://pubdocs.worldbank.org/en/470311 538669100475/WBRER14-web-ALB.pdf.