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# DEVELOPMENT OF ECONOMIC-THEORETICAL KNOWLEDGE IN NONLINEAR DIMENSIONS OF SYNERGY

# РОЗВИТОК ЕКОНОМІКО-ТЕОРЕТИЧНОГО ЗНАННЯ В НЕЛІНІЙНИХ ВИМІРАХ СИНЕРГЕТИКИ

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The objective need for radical transformations of complex economic systems and the development of modern tools for analyzing the underlying mechanisms of socio-economic changes requires a review of the methodological foundations of the traditional scientific knowledge. Rethinking of the content and role of existing methods of studying the fundamental concepts of traditional economic theory proves the relevance of the article. The purpose of the article is to develop innovative types of methodological reflections that open up new possibilities for the theoretical development of economic knowledge. The methodological basis of the article comprise methods and forms of research tested in economic science, such as a synergetic and systemic approach, the principle of co-evolution, methods of comparison, analysis and synthesis, methods of abstraction, historical and logical evaluation, empirical and theoretical knowledge. The article reveals the features of economic-theoretical knowledge and stresses the dominant role of the synergetic method in the process of economic-theoretical knowledge. The authors confirm that the key aspect of the synergetic methodology is "nonlinear thinking", which is represented by multi-variant and alternative evolution, and that the synergetic approach does not cancel the existing theoretical models of economic science and the corresponding categorical apparatus, but adjusts their development taking into account the new economic reality.

**Keywords:** economic-theoretical knowledge, methodological innovations, synergetics. nonlinear thinking.

Концептуальне усвідомлення радикальних перетворень надскладних економічних систем та розробка сучасного інструментарію дослідження глибинних механізмів соціально-економічних змін потребує перегляду методологічних основ традиційного наукового знання на основі критики стадіально-лінійних моделей суспільного розвитку та вироблення принципово нових підходів до нього як до відкритого, альтернативного та динамічного процесу. Реалізація цього завдання можлива шляхом імплементації здобутків синергетичної методології в процес економіко-теоретичного пізнання. Синергетика трактується як міждисциплінарний підхід до дослідження складних відкритих систем, що еволюціонують на засадах самоорганізації та саморозвитку. Застосування синергетичного підходу в економіко-теоретичних дослідженнях дозволяє осягнути складні господарські явища та процеси, які не знайшли відображення в традиційній економічній науці. В межах синергетичної методології переосмислюються фундаментальні поняття традиційної економічної теорії: економічна система, економічний розвиток, економічна динаміка, економічна нерівновага тощо. Використання методологічних новацій синергетики для аналізу сучасного економіко-теоретичного знання дозволяє осмислити його розвиток, акцентуючи увагу на тих аспектах, які найбільш характерні для сучасного етапу еволюції економічної науки, а саме: складності, плюралістичності; здатності до самоорганізації та саморозвитку; мультипарадигмальності; відкритості, що супроводжується постійним інформаційним обміном із зовнішнім середовищем; нестійкості та хаотичності, які генерують інновації та розширюють спектр дослідних можливостей; людиноцентричності економіко-теоретичного знання, людина ставиться в центр досліджень не тільки у зв'язку з пізнавальними процедурами, але і з тими результатами, що змістовним чином орієнтовані на побудову економічної реальності, яка також перебуває в процесі становлення та самоорганізації, є відкритою і нерівноважною. Синергетичний підхід не відміняє існуючі теоретичні моделі економічної науки та відповідний категоріальний апарат, а корегує їхній розвиток з урахуванням нової господарської реальності.

**Ключові слова:** економіко-теоретичне знання, методологічні новації, синергетика, нелінійне мислення.

**Problem statement.** Theoretical and methodological field of economic knowledge is a complex system of coordinates, which at the present stage of the development of the epistemological process conceptualizes different types of methodological reflections to solve cognitive tasks. At present, economic science is in a situation where the possibilities of its self-preservation, reproduction and development depend solely on the ability of the scientific community to generate reliable economic knowledge in the face of a pluralism of conceptual reference systems in the space of theoretical cognition. In the context of the new requirements for the methodological culture of thinking, the researcher's ability to apply innovative types of methodological reflections, which open up new possibilities for theoretical development of economic reality, becomes of paramount importance. And synergetics is precisely this very kind of methodological reflection.

**Analysis of recent research and publications.** The scientific community treats synergetics as an interdisciplinary approach to the study of complex open systems that evolve on the principles of self-organization and self-development. Along with the term "synergetics", the following terms are used as well: complexity theory, dynamic (complex) system theory, chaos theory, nonlinear dynamics or a more general term – nonlinear science, while at the same time expressing the fundamental "nonlinearity", "non-equilibrium", the complexity of the studied phenomena. Fundamental results in this field were obtained by A.E. Andersson [19], N. Grazhevska [21], H. Haken [17; 18], Ye.N. Knyazeva [9], R. M. Kronover [10], A. Medio [20], I. Prigozhin [14], etc.

**Emphasizing the unresolved parts of the general problem.** Back in 1969, Professor Hermann Haken first considered the key provisions of synergetics as a theory of self-organization of complex systems, Ilya Prigogine argued that synergetics is a whole complex of processes occurring in a system characterized by "dynamic chaos" "Self-organization of the elements", while Richard Kronover shows the inextricable link between fractal theory and chaos theory. The adherents of economic synergetics emphasize the qualitative changes in the fundamental characteristics of modern socio-economic systems associated with the formation of a new economic reality (post-industrial, information society, industrial civilization, economic civilization, etc.). The application of the synergetic approach in economic-theoretical studies allows us to comprehend the complex economic phenomena and processes which did not find their reflection within the traditional economic science.

**The purpose of the article** is the analysis of economic and theoretical knowledge in the context of synergetics.

**The main research material.** Recognizing pluralistic character of economic-theoretical knowledge allows us to apply philosophical and worldview achievements of synergetics to the analysis of its nature, driving forces and mechanisms of evolution. In the last two decades, with the rapid growth of scientific and technical knowledge, the features of the third wave of economic revolution have been revealed, which necessitates the study of the causal relationships of economic factors of the new era The study of the system of economic- theoretical knowledge through the prism of the synergetic approach makes it possible to distinguish its following features:

1. *Complexity, polystructuredness*. As already noted, the system of modern economic-theoretical knowledge is extremely complex both in the diachronic and in the synchronic aspects of its consideration [2]. In this case, the basic unit of the structure of this system contains the following components: ontological (objective conditions of evolution, a picture of economic reality); epistemological (philosophical foundations, prerequisites and criteria characteristics of scientific activity, methodological principles, methods and instruments of scientific research, self-reflection of fundamental economic science); axiological (humanistic, moral values, ethos of science) and praxeological (organization and technology of scientific research, prerequisites and mechanisms of practical application of scientific results). At the same time, the structure of the constantly evolving economic-theoretical knowledge, which changes the content, sociocultural and philosophical characteristics, is represented by the forms of its organization (concepts, hypotheses, theories, doctrines, schools, trends, directions, paradigms, pictures of economic reality), qualitative features of structural relations, (deterministic, probabilistic, hierarchical, heterarchical, etc.), complex network and multidimensional nature of these relationships (internal, external and mixed, derivatives) [16, p. 31–37].

2. *Self-organization and self-development*. In modern highly specialized and institutionalized economic science the real subject of scientific cognition is the scientific community,

whose members are scattered in space and time and interconnected by a network of formal and informal information channels and interactions. The consequence of these communications within the collective entity is reaching consensus regarding the truth of certain hypotheses, concepts and theories, which always possesses conditional and temporary character open for reconsideration.

It is important to emphasize that the spontaneous process of self-organization of economic-theoretical knowledge is long-term in time, due to the actual and potential "lack of finality" of scientific statements both in the theoretical and empirical aspects. We should also keep in mind that there is no absolute uniqueness of the sense and the meanings of scientific terms and statements, which stimulates the development of a number of methods and techniques aimed at reducing this ambiguousness (introduction of various types of conventional definitions, formalization of the scientific language, etc.) [11]. At the same time, self-development of economic-theoretical knowledge takes place under the influence of both external (transformation of economic reality, interdisciplinary communication, change of the scientific picture of the world), and internal factors of the scientific community due to the existence of the so-called "pure economics".

3. *Multiparadigmality and multi-vector dynamics*, which unfolds through adaptation and bifurcation (the periods of normal development of science and scientific revolutions using T. Kuhn's terminology). In this case, the following types of scientific bifurcations are singled out:

1) revolutions characterized by anomalies and crises caused by the expansion of economic science to new subject areas and revolution, which arise without anomalies and crises due to their interdisciplinary interactions and "paradigmatic" vaccinations;

2) global revolutions (general scientific and disciplinary) and local revolutions caused by radical changes in individual elements and interconnections of structural elements of economic-theoretical knowledge [16, p. 48].

However, if we proceed from the "economic science phase development" it is important to avoid, on the one hand, the "dogmatized perception of its methodological definitions as a system of unchanging (canonical) postulates and algorithms" [6, p. 73] and, on the other hand, to realize the principle of continuity, "which is also embodied at the level of development of economic methodology and accordingly relates to the method of implementing not only its positive, but also the normative function" [6, p. 73] , – stresses A.S. Galchinsky (2010).

4. *Openness – constant information exchange with the external environment*. An example of such internal-scientific metabolism is "economic imperialism", in which the economic approach is declared universal for all social sciences, and in the broader sense – practically for all spheres of human life. On the other hand, there is a tendency to study economic patterns as an isolated case of wider social processes involving cognitive means of sociology, psychology, history, political science, etc. The complexity and openness of economic-theoretical knowledge causes the nonlinear development of economic science. Despite its close connection with the mental archetypes of the respective epochs, the history of economic thought shows that the reaction of scientists to changes in the external or internal environment of the development of economic-theoretical knowledge is not proportional to these changes.

5. *Instability and chaotic nature, which generate innovations and expand the range of research opportunities*. According to modern scholars, a person's creative activity requires periodic involvement of the constantly present in the sphere of the subconscious stochastic, chaotic movement of the mind. In such a case, creative thinking is multi-vector aimed at finding a variety of ways to solve a scientific problem. From time to time, wandering around the field of possible ways of development, chaotic movements of the creative mind come across a certain structure-attractor contributing to the breakthrough [9, p. 137, 139].

The methodological significance of the synergetic understanding of "chaos" is manifested in the development of modern "techniques of chaotic knowledge" [1, p. 183], which allow scientists to realize new possibilities of creative activity. Creative thinking is "divergent". While the process of "convergent" thinking initiates transition from the original problem through a series of previously defined operations to the only correct solution, then divergent thinking allows "to search in different directions from the original problem, to offer many possible ideas and combinations of ideas that can act as solutions" [1, p. 183]. Chaos in this context is a "random generator", a generator of diversity, from which a new unity is created; a new structure is generated as well as a new system of theoretical knowledge.

As already noted, the key aspect of the synergetic methodology is "nonlinear thinking".

According to S. Mochernyi [13], its most important features are: multiple options and alternativeness to evolution; the possibility of choosing the best ways for such an evolution; the possibility of accelerating the pace of development, in particular the initiation of accelerated nonlinear growth; the influence of each individual on macro-social processes; the inadmissibility of imposing development paths on the social systems; the course of social processes in conditions of uncertainty, instability; irreversibility of development; evolutionism and integrity of the world [13, p. 99].

The proof of "nonlinear thinking" is the human brain itself, which, in contrast to software-controlled computers, is characterized by fuzziness, incompleteness, reliability and resistance to the "order", as well as the presence of chaotic states and sensory dependence of the initial data. These properties are well known as the properties of a "nonlinear" complex system, which "self-organizes and self-evolves" [12, p. 95]. Processing of information in the human brain is guided by complex neural networks that function in accordance with the learning algorithms. For the synergetic methodology, it is vital that the microscopic neurons "in the brain are linked with one another" which leads to the emergence of "macroscopic patterns" [12, p. 95]. Thus, the cognitive properties of the brain correlate with macroscopic patterns.

6. *Man-centeredness*, in which the economic-theoretical knowledge acquires multidimensionality of the person himself. It implies awareness of the complex structure of the human cognitive system, the variety of ways to understand the economic reality, the necessity to consider the unconscious [4], the dependence of judgments and conclusions of researchers on their pragmatic interest, operational characteristics and the specifics of the communicative environment [3, p. 3]. Under these circumstances, the classical description of the subject-object type loses its versatility and complements the descriptions of the communicative type associated with the interdisciplinary communication of the participants in the cognitive process.

It is important to note that human-dimensional economic-theoretical knowledge implies that a person is placed at the center of research not only in connection with cognitive procedures, but also with those results that are substantially focused on the construction of an economic reality that is also in the process of formation and self-organization and is itself open and non-equilibrium. In this context, the synergetic approach to the analysis of the development of the dynamics of economic science does not only overcome the classical subject-object opposition of scientific cognition but also exacerbates the problem of considering the measure and degree of involvement of the subject in this process without losing the scientific status of economic-theoretical research.

In the context of the problem under study, the issue of correlation between synergetics and dialectics needs a methodological clarification. In the authors' opinion, synergetics "removes" the contradiction between determinism and chance: determinism, especially theory, on which science can solely rely, exists but the infinite number of interactions and mutual influences which each time are combined in a different way, form a reality, full of randomness, unexpectedness and risks. The infinity of the world, its inexhaustibility and boundless complexity, do not allow us to trace all causal relationships, based on determinism in science and practical economic activity.

Indicative in this respect is the model of science development by I. Lakatos, in which the role of meta-theoretical structural modules of scientific development is played by competing research programs. It contains conventionally accepted basic elements, namely:

1) "hard core" – a set of scientific assumptions that are kept unchanged in the theories that are part of the research program;

2) "protective belt" (the "dynamic zone" of theories and auxiliary constructions) – auxiliary hypotheses that protect the kernel from falsifications, and theoretic provisions which are constantly changed, corrected, updated during the development of a certain theory or under the influence of scientific criticism;

3) "positive and negative heuristics" – methodological rules that contribute to the positive development of the research program, a number of scientific assumptions, hypotheses, scientific approaches, which "either find confirmation or rejected in the event of refutation" [5, p. 61–62]. In such a situation, "determinism", "causal relationships" no longer have the meaning, as is customary for the traditional / "canonical" methodology according to A. Galchinsky [6].

It is important to note that synergetics makes causality of development understandable in principle, thus eliminating the need for dialectics in the Hegelian-Marxist sense. At the same time, dialectics remains one of the modes of thinking that can be applied under certain specified conditions. Marxist methodology is based on

three postulates: "dialectical materialism, historical materialism and dialectics." At the same time, the Western science formed its initial triangle in this way: positivism, philosophy of individualism, linear logic. Although seemingly different, the paradigms are almost symmetrical. Credo of dialectical materialism is “reality given to us in sensation”. In essence, this credo is aimed at the identity of scientific truth and common sense. Very close comes the notion of positivist reality. In this context, historical materialism is much more distinct from the "philosophy of idealism," because in it collectivism is rigidly opposed to individualism [7, p. 17].

As far as dialectics is concerned, its postulates ("the law of the unity and struggle of opposites", "the law of the negation of negation", "identity and difference", etc., are entirely compatible with the construction of "nonlinear" interactions. Linearity involves successive transitions from "cause to effect", which may well be interpreted in terms of the law of the negation of negation as well as the existence of a rational content of scientific truths, the criterion of which is the practical adaptation of man to "narrow" understandable "dialectical materialist laws" [7, p. 17]. This circumstance restricts the development of science in the information society and its perception of mass consciousness.

There is no support and claim of dialectics for the role of "universal method of cognition". Today, the hypothesis of the existence of "universal methods of cognition" (as well as "omnipotent teachings") looks rather doubtful since such methods must correspond to the cognized object, just as the key relates to the lock. Since there are no universal keys, apparently there are no universal methods. "Mathematics and dialectics are not universal – this is evidenced by the history of knowledge" – notes V. Prytkov [15].

Thus, the use of methodological innovations in synergetics to the analysis of modern economic-theoretical knowledge allows us to comprehend its development in a new "system of axes" focusing on those aspects that are most characteristic of the modern stage of the evolution of economic science, namely: pluralism, nonlinearity, unpredictability of development due to the complication of economic reality and the intensification of creative processes of stating and solving scientific problems.

**Conclusions:**

1. We can state that the use of methodological innovations of synergetics in the analysis of modern economic and theoretical knowledge makes it possible to comprehend its development in a new "coordinate system", focusing on those aspects that are most characteristic of the current stage of the evolution of economic science, namely: pluralism, nonlinearity, alternativeness and unpredictable development.
2. The study of the system of economic and theoretical knowledge through the prism of the synergistic approach allows us to distinguish its following features: complexity, ability to self-organization and self-development; multi-paradigm and multi-vector dynamics; openness, constant information exchange with the environment; instability and chaotic nature that generate innovations and expand the range of research opportunities.
3. Synergetic approach complements the existing economic-theoretical models, categorical apparatus, and also develops their potential focusing on innovative approaches to the analysis of modern economic realities, creating the basis for forming the general systemic paradigm of economic theory and deepening the methodology of scientific knowledge through the use of the system "nonlinear thinking" as a key aspect of the synergetic methodology.

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