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Implementation of Potential of the Transdisciplinary Approaches in Economic Studies

Tatiana E. Stepanova[a], Nadeghda V. Manokhina[b], Maria E. Konovalova[c], Olga Y. Kuzmina[c] and Lyudmila M. Andryukhina[d]

[a]Samara Institute (branch) Federal State Budgetary Educational Institution of Higher Education «Plekhanov Russian University of Economics», Samara, RUSSIA; [b]Saratov Socio-Economic Institute (branch) Federal State Budgetary Educational Institution of Higher Education «Plekhanov Russian University of Economics», Saratov, RUSSIA; [c]Samara State University of Economics, Samara, RUSSIA; [d]Russian state vocational pedagogical University, Ekaterinburg, RUSSIA

ABSTRACT

The relevance of the researched problem is caused by the increasing interest in using potential of transdisciplinary approaches, and mathematical methods, which include the game theory in analysis of public and economic processes. The aim of the article is studying a possibility of implementation of the transdisciplinary approaches in economic researches. The leading approach is institutional and evolutionary, which allows to reveal such tendencies of relationship development and interrelations of individuals that remain hidden and implicit. It also allows to receive new and quite unexpected important results, significant for practice. In the article the hypothesis is proved. According to it, innovations, its generation and autopoiesis itself are structural units. In the innovative environment it assumes various forms. The materials of the article can be useful for development of the theory of the system analysis, and also when developing macroeconomic forecasts of social and economic development.

KEYWORDS
Methodologic monism, mathematical methods, game theory, transdisciplinary approaches

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CORRESPONDENCE Maria E. Konovalova mkonoval@mail.ru

Introduction

The development of science in various fields of knowledge, proceeding both in the evolutionary and revolutionary forms, inevitably faces the pressing problem of limitation of the applied methodological approaches and tools, having the traditional character. At the same time, some researchers successfully develop and skillfully use new scientific approaches and paradigms. The transdisciplinary approaches, which are seldom applied in modern scientific researches, are among them. It is important that in relation to economic researches these approaches are not used at all. The authors aimed to disclose the content, specific nature and potential of the transdisciplinary approaches, which can be applied in various directions of the economic analysis, in order to solve this problem.

Literature review

The term "transdisciplinarity" was for the first time offered in 1970 by the Swiss psychologist and philosopher (Piaget, 2001) within the International Working Group "Interdisciplinarity – training and research programs at universities" (Grebenshchikova, 2012). Further researches, in particular (Remadier, 2004), proceeded from the understanding that "… the multidisciplinarity and interdisciplinarity do not disturb disciplinary thinking. … In the case of the multidisciplinarity the purpose is imposing theoretical models of different disciplines. The interdisciplinarity differs from it in creation of the general model for the involved disciplines, based on the dialogue between the disciplines". R. Lawrence (2004) investigated the results of its theoretical explication and revealed them in three interconnected prospects: revaluation of ideas about the gnoseological value of knowledge, new ideas about the subject of knowledge and prerequisites for formation of theories. The Belgian scholar Judje (1994) emphasized four types of the transdisciplinarity in modern science.

In the national science a number of scientists, for example, of L.P. Kiyashchenko (2009) and V.I. Moiseev (2009) deal with the problem of the transdisciplinarity. They consider genesis and actualness of the transdisciplinary researches. The problem of the transdisciplinary approaches is considered by the scientist M. Moki (2010). The transdisciplinary paradigm of innovation studies is developed by E.G. Grebenshchikova (2012). The authors of this article have publications on this problem.

Methods

Research methods

The following methods were used in the course of the research: theoretical (system, structural and functional, institutional and evolutionary, reproduction, dialectic and materialistic); empirical (social polling, observation); methods of mathematical statistics and graphic representation of the results.

Experimental research base

The works of national and foreign authors in the field of Institutional Economics are the experimental basis of the research.

Investigation stages

The research of the problem is conducted in several stages. At the first stage the theoretical and methodological questions concerning the possibility of implementation of the transdisciplinary approaches in economic researches were investigated. The second stage is connected with the analysis and evaluation of use of the theories and concepts having the transdisciplinary character, as basic methodological approaches. The final stage of the research was studying of implementation of the game theory as one the youngest mathematical approaches in the applied aspect, it showed interrelation of the state and business.

For the study of the transdisciplinary approaches in economic researches the integrated methodological platform is used. It includes general scientific methods, analytical tools of applied sciences, in particular methodological approaches and the principles of the game theory; the complexity, fractal, turbulence, autopoiesis theories and the theory of economic genetics supplemented the theoretical and methodological base of the research.

Results and Discussions

The authors believe that in modern science the appropriate attention should be paid to the use of theories and concepts, having the transdisciplinary character as basic methodological approaches. One of the transdisciplinary approaches, having considerable potential in economic researches, is the game theory. Use of mathematical methods, which include the game theory, in the analysis of economic phenomena allows to reveal such tendencies and interrelations, which remain hidden while using other methods, and even to receive quite unexpected results.

Note that the game theory is among the youngest mathematical disciplines. Its emergence as an independent branch of Mathematics is referred to the middle of the 50s, when the famous monograph O. Morgenstern and F. Neumann (1947) "The theory of games and economic behavior" was published. Sources of the game theory are connected with the works of E. Borel (1969). At this point the game theory turned into the whole mathematical direction, which possesses interesting results and has a large number of practical recommendations and supplements.

Let's consider the key concepts of the game theory. Each formalized game is characterized by:

– a number of participating subjects, named players;

– a set of actions, possible for each of the player, named strategy;

functions of payoff (payment) reflecting the degree of satisfaction of interests of each of the player;

– the result of a game, which is determined by chosen strategies of players and which also defines the payoff (loss) of each of the player.

At a later stage the game theory was supplemented with new interesting developments (Morgenstern & Neumann, 1947). One of them is Nash Equilibria. This principle of the game theory means that each player does the best that he can do under specific actions of other players or the player (opponent). As a result, none of the players has no incentive to change his state.

There are different ways of description of games. One of them lies in the fact that all possible strategies of players are considered and the payments, corresponding to any possible combination of a strategy of players, are defined. The game described in such a way is called the game in a normal form (Neumann, 1959).

The normal form of the game with two participants consists of two game matrixes showing what sum of money will be received by each of the players at any possible strategy pairs. Usually these matrixes are expressed in the united form, which is called a bimatrix. The elements of the bimatrix are number pairs. The first one determines the merit value of the first player, and the second – the merit value of the second. The first player (for example, the state) chooses one of the m strategies, at the same time the matrix row i corresponds to each strategy (i = 1,…, m). The second player (for example, business) chooses one of the n strategies, at the same time the matrix column j corresponds to each strategy (j = 1,…, n). Number pairs at the intersection of rows and columns show the merit value for each of them. In the general case, if a player I chooses a strategy i, and a player II – strategy j, then the payoff of the first and second players is respectively equal h^1_{ij} and h^2_{ij} (i = 1,…, m; j = 1,…, n), where m, n – a number of finite strategies according to the player I and II. It is supposed that all elements of the bimatrix are known to each of the player. In this case their strategy is called certain and has a finite number of options. If any options of the strategy of the opponent (matrix elements) are unknown to the player, then a game is called uncertain and can have infinity of choice (strategies).

There are also other classes of games, where players win and lose at the same time.

Antagonistic games of two persons are connected with the fact that one of players wins exactly as much as the other loses. In such games interests of its players are directly opposite each other.

As an example we will consider a game, in which two players participate. Each of them has two strategies. The payoff of both players is determined by the following rules:

– if both players choose strategies with identical numbers (the player I – i_1, the player II – j_1), then the first player wins, and the second loses, (the state raises taxes – business pays it, i.e. the payoff of the state defines business loss);

– if both players choose different strategies (the player I – i_1, the player II – j_2, then the first loses, and the second wins (the state raises taxes on business – business evades it; loss of the state – win of business).

The bimatrix of payoff will be as follows:

h^I_{11}; h^{II}_{11}	h^I_{12}; h^{II}_{12}
h^I_{21}; h^{II}_{21}	h^I_{22}; h^{II}_{22}

or

+1; -1	-1; +1
-1; +1	+1; -1

h – payoff (loss) of a player.

The analysis of the bimatrix shows that in the antagonistic game the winning amount of the players I and II comes out at zero, i.e

$$h^I_{ij} + h^{II}_{ij} = 0, \quad \begin{matrix} i=1,\dots,m, \\ j=1,\dots,n, \end{matrix} \quad h^I_{ij} = -h^{II}_{ij}. \qquad (1)$$

The game theory is the theory of mathematical models of such phenomena, in which participants ("players") have various interests and have freely chosen ways ("strategies") for achievement of their purposes. In the majority of the works on the game theory it is supposed that interests of participants can be measured quantitatively. They are also real functions of situations, i.e. sets of strategies, received while choosing some strategy by each of the player. For obtaining results it is necessary to consider these or those classes of games emphasized by some restrictive assumptions. Such restrictions can be imposed in several ways. Let's consider them with regard to interrelation of two main players of the economy – business and the state. It is possible to emphasize several ways of imposing restrictions.

1. Restrictions of opportunities of relationship between players. The elementary case is when players act absolutely discretely and can not consciously help or disturb each other with any action or inaction, information or misinformation. Such situation inevitably comes when only two players (the state and business), having opposite interests, participate in a game: increase in the payoff of one of them means reduction of the payoff of the other. Without breaking the community, it is possible to accept the total payoff of both players equal to zero and to treat the payoff of one of them as the loss of the other.

These games are called antagonistic (or two-person zero-sum games). They presuppose that there can not be any relationship between players, no compromises, no exchanges of information, as each message received by a player about intentions of the other can only increase the payoff of the first player and increase the loss of his opponent.

To draw the conclusion, in the antagonistic games players can not have direct relationship and at the same time to be in state of a game (opposition) towards each other.

2. Restrictions or simplifying assumptions on plenty of strategies. In the simpliest case the strategies are final, it eliminates the situations connected with possible coincidences (convergence) in strategies and saves from the need to put in any topology.

Games in which sets of strategies of each of the player are final, they are called finite games.

3. Assumptions about the internal structure of each strategy, i.e. about its content. For example, functions of time (continuous or discrete) can be considered as a strategy. The values of time are actions of a player at the corresponding moment. These and similar games can be called dynamic (positional).

Objective functions can be restrictions on strategies of players, i.e. determination of those purposes on which implementation of this or that strategy is directed. It is possible to assume that restrictions upon a strategy are connected also with the ways of achievement of these purposes in this or that time-frame. For example, convergence of business to achieve decrease in the amount of obligatory fiscal charges, sales of currency gain in the short-term period. If the assumptions about the nature of a strategy are not made, they are considered as some abstract set. Such games in the simplest formulation of questions are called games in a normal form.

Finite antagonistic games in a normal form are called *matric*. This name is explained by the possibility of the following interpretation of games of this kind. Let's imply the strategy of the first player (the player I – the state) as rows of some matrix, and the strategy of the second player (the player II – business) – as its columns. For concision strategies of players are called the numbers of the matrix. Then the sectors of the matrix standing at the intersection of each row with each column are situations of the game. Filling in these sectors with numbers, which describe the prizes of the player I in these situations, we finish the game task. The received matrix is called the payoff matrix, or the game matrix. The payoff of the player II in each situation is determined by the payoff of the player I, differing from it only in a sign. That is why subsequent designations on the function of the payoff of the player II are not required.

A matrix having m rows and n columns are called (m x n) – the matrix, and a game with this matrix – (m x n) – the game.

The process (m x n) – games with the matrix can be presented in the following way:

$$A = \begin{pmatrix} a_{11} \ a_{12} \dots a_{1n} \\ a_{21} \ a_{22} \dots a_{2n} \\ \dots \ \dots\dots\dots \\ a_{m1} \ a_{m2} \dots a_{mn} \end{pmatrix} \qquad (2)$$

The player I fixes the line number i, and the player II –the column number j, after that the first player receives from the opponent the sum a_{ij}.

The purpose of the player I in the matrix game is to receive the maximum payoff, the purpose of the player II consists in giving to the player I the minimum payoff.

The player I (the state) chooses some strategy i. Then in the worst case he will receive payoff min a_{ij}. In the game theory, the players are considered careful, counting on the least favorable turn of events.

Such state for the player I can occur in the case when the strategy i becomes known for the player II (business). Expecting such an opportunity, the player I should choose the strategy i_o to maximize this minimum payoff:

$$\min_j a_{i_o j} = \max_i \min_j a_{ij} \qquad (3)$$

The value standing in the right part of equality is the guaranteed payoff of the player I. The player II (business) has to choose such strategy of j_o

$$\min_j a_{i_o j} = \max_i \min_j a_{i_0 j}. \qquad (4)$$

The value in the right part of the equation is the payoff of the player I. He won't be able to receive more, if the opponent acts correctly.

The true payoff of the player I should be in the interval between the values of the payoff in the first and second cases. If these values are equal, then the payoff of the player I is quite a fixed number, the games themselves are called quite certain, and the payoff of the player I is called the value of the game and it is equal to the matrix element $a_{i_0 j_0}$.

The players can have additional opportunities – to choose strategies incidentally and independently from each other (strategies correspond to rows and columns of the matrix). The random choice of the strategy by the player is called the mixed strategy. In the (m x n) – game the mixed strategies of the player I are defined by sets of probabilities X = (h1,…, xm), with which this player chooses the initial, pure strategies.

Neumann's theorema is the basis for the theory of the matrix games. It is about active strategies: "If one of the players adheres to the optimal strategy, then the payoff remains unchanged and equal to the game value V regardless of the fact that the other player does. If it does not exceed the bounds of the active strategies (i.e. uses any them in pure form or mixes them in any proportions). Note that we call an active strategy a pure one, which is included in the optimal mixed strategy with probability different from zero.

The main aim of the game is to find the optimal strategy for both players, if not with the maximum payoff, then with the minimum loss for both. The method of finding of the optimal strategies gives often more, than it is necessary for practical purposes.

In the matrix game it is unnecessary for the player to know all the optimal strategies, as all of them are interchangeable. It is enough to know one of them. Therefore, in relation to the matrix games the question of finding at least one optimal strategy for each of the player is urgent.

The main theorema on the matrix games establishes existence of value of the game and optimal mixed strategies for both players. The optimal strategy is not obliged to be the only one. It is a very important conclusion received on the basis of the game theory.

In our research we will rely on the assumption that each subject of the matrix game has the following features:

– the matrix entries are interpreted as monetary payments, and as a result win or loss is estimated in cash;

– each of the player applies the utility function to these elements;

– in the game each player acts as if the utility function of his opponent made just the same impact on the matrix.

These assumptions lead to the nonzero games, in which the relations of cooperation, trade and other types of intercommunication between the players both prior to the game, and in its process.

Generalization of the game theory leads to interesting, but rather difficult objectives. When developing it, it is necessary to apply utility function not only to monetary results, but also to the sums with expected future outcomes. This assumption is disputable, but we find it possible to accept it. In this case we rely on the fact that this assumption has similarity with the behavior of players in certain situations of decision-making. It also entertains a possibility that the way of conducting the game by this player depends on the state of its capital during game playing.

Let's consider it on the following example. Let us suppose that the first player possesses the capital in x dollars by the time of the beginning of the game g. Then in the end the game his capital will be equal to $g_{ij} + x$, where g_{ij} – is the received payoff from the game. The usefulness is equal to f (g_{ij} + x), where f is utility (usefulness) function.

In a similar vein to the above, if the second player has the capital in z dollars at the beginning of the game, and in the end of the game, taking into account loss (p_{ij}), its capital is z + p_{ij}, then he calculates usefulness of the result on the formula f = (z + p_{ij}).

Note that players can have different subjective attitude and economic assessment of the reached utility function. One of them is characterized by the fact that the player estimates usefulness of his payoff according to its value (the more is payoff – the higher is assessment of its usefulness). It is necessary to call this relation rational.

Another type of the relation is connected with attention concentration of the player on the payoff of the big sum. For him the considerable payoff is represented bigger than it is actually, and big losses are underestimated. This relation is caused by presence of big sums of money before the beginning of the game.

The third type of the relation of the player to the game is connected with his willing to avoid big losses. That is why he exaggerates big loss and underestimates big payoff.

There are separate interesting situations. "The winning relation" is the relation of the player, who besides setting the value of payoff or loss, also charges positive and negative premiums.

"The desperate relation" is the relation of the player, who should win this sum of money by all means. Any quantity of money lesser than this sum has no value for him. However, he also does not appreciate any quantity of extra money.

Let's turn our attention to the fact that assessment of the reached usefulness of the payoff is made by each player subjectively and quite often independently from each other. It means that each of the players can interpret the received result differently. This result is optimal. Depending on his attitude, the player shows bigger (or smaller) activity and interest in the game. For evaluation of usefulness of the result for each player, the capital value before game and speed of its increase (reduction) during the game are of great importance.

Consequently, along with the actual value of the payoff (loss) of players, it is necessary to consider various subjective relations of players to this game and their economic assessment of the achieved purpose, its usefulness, and the importance of the game in general.

Let's note that the game theory is applied to the economic situations, in which economic decision-making is carried out in the conditions of uncertainty, i.e. when it is impossible to determine unambiguously key parameters and variable models of the studied process or a phenomenon. Possible actions of each of the parties, called strategies, also have the classification. Strategies can be pure and mixed. A pure strategy is focused on the certain behavior of the player-opponent. A mixed strategy is oriented on several possible strategies of behavior of the player – opponent.

There are various classifications of games: by the number of players, by the number of strategies, by the properties of the payoff function, by the possibility of preliminary negotiates and interactions between players during the game.

By the number of players we can distinguish games with two, three and larger number of players. By the number of strategies there are finite and infinite games. In finite games participants possess the finite number of strategies, in the infinite games relatively the infinite number. By the properties of the payoff function there are zero and nonzero sum games with the zero.

Depending on the possibility of preliminary negotiates between players there are cooperative games (with coherence of the made decisions) and noncooperative games (without preliminary negotiates and coherence of actions). It is possible to distinguish games by the volume of information on previous behavior. In this regard they are divided into games with full and incomplete information.

Implementation of potential of the transdisciplinary approaches in the game theory, allowed to receive the following results. In the relationship of business and the state, which were presented as different types of games, it is always possible to find the optimal strategy. Besides, there can be not one, but a set of strategies (the area of optimal strategies). It is especially important for searching and development of the optimal strategies even in the antagonistic games in order to form partnership of the state and business. Implementation of the game theory allows to predict the algorithm of actions of the players. It happens because after losing one game, players begin or intensify the actions in those types of games where their win is most probable.

In this research the relationship of the state and business are presented as different types of games, where the main objective is finding the solution of a game, i.e. determination of the optimal strategies (or a strategy) applied to achievement of the corresponding purposes and macroeconomic parameters. Relationship of the state and business, and also various business structures are the some kind of different types of games, which are carried out by them in the sphere of production, distribution, in real and monetary sectors of the economy, in branches and on the levels of the economy management, in the national and world markets. Use of potential of the transdisciplinary approaches and the game theory in the analysis of public and economic processes, in this option - in the analysis of relationship of the state and business – allows to reveal their new qualities as players and tendencies inherent in their relationship. This is especially important under the conditions of strengthening of globalization of national economies.

The authors believe that there are also other perspective transdisciplinary theories, the methodological approaches peculiar to them, and applicable to the economic area of researches:

– the autopoiesis theory; according to it, the mechanism, turning systems into autonomous unities, becomes apparent through the autopoiesis – the process of reproduction (self-generation) by the system of its components for the purpose of preservation of self-identity. Implementation of this theory allows to expand the methodological basis and the object field of the scientific research, to reveal "self-recreation zones" in the innovative environment and to develop reasonable mechanisms of institutional management;

– the complexity theory generalizes a set of new interdisciplinary and transdisciplinary approaches (Judge,1994), it is focused on the processes of generalization and development of self-organizing structures in systems, which are dynamic, emergent, factual, nonlinear. The complexity theory is based on the premise, the chaos theory, nonlinear nature and complexity are considered as the single overriding paradigm. This theory is built on the following basic concepts: adaptivity, self-identity or fractality, when separate elements and subsystems are similar on different levels of the unified entire system, self-organization and self-regulation, attractors – a set of endogenous and exogenous conditions, «the edge of chaos», representing boderline state, a narrow zone between the system, which is in equilibrium, order, and chaos that destroys this system. In such state of the systems which are on "the edge of chaos" the processes of their self-organization are generated, "a hilly landscape" – uncertainty and nonlinearity of processes cause its unpredictability in the environment of coexistence of systems, alternation of "hills of success and efficiency" with "lowlands of instability and disbalance".

Using approaches of the complexity theory, it is possible to investigate the processes, which never repeat accurately, every time they come to equilibrium at different points of the phase plane, show self-identity, difficult adaptable systems themselves have also an ability to self-organization, the result of their functioning can not be given in advance, even with some probabilistic assessment of adequacy;

– the fractal theory; where fractals are various self-similar structures, recursive models, each part of which repeats in its growth development of the whole model in general. Implementation of fractals allows to give form to complicated processes and objects. This is valuable in the field of institutional modelling. It also allows to describe unstable systems and processes and to predict trends of future development of such objects;

– the turbulance theory represents it as a self-organization phenomenon. It results in regular or irregular – chaotic transitions from disorder to order and backward. It is also represented as a particularly complex movement pattern of the national economy and separate subjects (firm) in "vertical flow" of various changes; as an extreme degree of instability of the global economic system. This theory allows to reveal what multidirectional forces and actions contains the economic turbulence, and what are the new rules of the game in these difficult conditions for all economic entities;

– the theory of economic genetics studies characteristics of heredity and variability of various economic systems, relations and interrelations, farm patterns, which arise between the subjects and reflect in material and ideal carriers of these relations (products of human activity). It proved that evolution of a firm, as an institute of economics, has the genetic nature and is carried out through transfer of economic genes – the mechanism of reproduction of knowledge assets about characteristics of a firm selfregulation. It includes information on the applied business models, content of different types of factors of production and their cooperation, institutional contradictions and ways of their solving, failures of a firm and methods of their elimination, factors of growth and trends of development of a firm, its life cycle (Grebenshchikova, 2012).

So, implementation of the transdisciplinary approaches in modern science is not only possible, but also is necessary as it advances the methodological basis on the higher level and gives new, original and significant scientific results.

Within the framework of the accomplished projects, usage of the transdiscilinary approaches allowed to obtain the following results. In relation to the innovative environment, the hypothesis is proved: the autopoiesis structure (unit) are innovations, their generation, the autopoiesis itself assumes different shapes in the innovative environment. Such forms are self-recreation of the intelligence of individuals, intellectual systems as the basis of generation of innovations, self-reconstruction of the institutional gaps, institutional traps and institutional vacuum caused by various innovative processes. The autopoiesis of the innovative environment is dualistic. It is connected with self-reproduction of effective (positive) elements of this environment and its inefficient (negative) elements. The autopoiesis can be also accompanied by pathological self-reproduction when self-completion happens with certain mutations of elements of the innovative environment. Activation of self-reproduction of effective (positive) elements of this environment and evening-out, elimination of its inefficient (negative) elements objectively causes the need of institutional management. The model of the complementarity of institutional management and the autopoiesis in the Russian innovative environment is developed.

The concept of formation of the nanotech industry in Russia is developed. It includes the analysis of formation of new technological ways in the structure of the Russian economy, definition of the term system of the nanoeconomics, disclosure of regularities of formation of the nanotech industry and institutional traps inherent in it, identification of externalities of development of nanotechnologies, and also justification of the main directions of formation of the nanotech industry in Russia including creation of the national nanotechnological network, the market of nanotechnologies and nanoproducts, development of the system of road maps on the main directions of development of the nanotech industry. Basic elements and content of the institutional model of formation of the nanotech industry in Russia, and also entropy of its realization are defined.

Emergence of new approaches in the modern science and economic theory is caused by a variety of reasons:

– the increscent vacuum in the existing methodological approaches, specific for the concrete direction of the economic science (for example, institutionalism), which began to form within the classical school, are supplemented by the Marxist and Neoclassical schools, but are still very traditional and preserved;

– in modern economic space there is a multiple complication of various processes and phenomena, their interrelations. This is projected on the purposes and problems of the real and future researches. It demands methodological approaches of the higher level.

We will emphasize the three main problems in the methodology:

1. Expansion and updating of the categorial apparatus, the flow of new terms borrowed from other sciences (pathology, genes, mutation, vacuum).

2. The new directions of the research – econophysics, quantum economy, Darvinian economy, happiness economy.

3. Formation of a new methodology of the economic science (avoiding methodologic pluralism and preference of dualism and methodologic monizm).

The most important methodologic principle of the evolutionary economics is the methodologic monizm – it is the idea that both natural and social sciences should be supported by the united methodology unlike the "methodologic dualism". According to it, social sciences can't use methodology of natural sciences. Currently the principle of the methodologic monizm is developed to an extent that among economists there is the belief that the economy is more the natural science, than human.

Reliance on the united methodology is proved by the following reasons (Moki, 2014).

Firstly, the classic economy, using the private methods, could not neither forsee, or explain the development of the real economic situation. The events connected with the last economic crisis of 2008-2010 prolonged in 2014-2015 testify to it.

Secondly, the outstanding scientific results are obtained at the intersection of sciences. That is why it is necessary to prevent self-isolation of the economic science, promoting at the same time integration of sciences and development of the allied disciplines.

Thirdly, while studying economic systems, we deal with difficult developing dynamic systems therefore we are forced to use the methods of natural sciences as they have accumulated vast experience of creation and studying similar systems.

Implementation of the concrete methodology in the scientific research is essential as it predetermines effectiveness, success or fiasco in solution of specific problems.

There is the classification of scientific approaches in 4 main types by the degree of completeness of knowledge of the world around: the disciplinary, interdisciplinary, multidisciplinary approaches and the transdisciplinary system approach. The disciplinary approach divides the world around and environment in separate subject domains. The interdisciplinary approach allows direct transfer of methods of a research from one scientific discipline to another. This is caused by the similarity of the studied subject domains (Kiyashchenko, 2009). The multidisciplinary approach is willing to use the generalized image of the research subject. In relation to it, all its disciplinary images appear as parts, that is why transfer of methods doesn't take place; all the disciplines remain within its own methodological principles. Comparison of the results of the disciplinary researches within the multidisciplinary approach allows to find new similarities of the research subject domains. This generates new interdisciplinary researches. The work of V.A. Melnikov (2007) "Quantum Economics" can be noted as one of the most successful experience of the interdisciplinary researches. In due time the Quantum Physics provided a scienifically-based "overflow" of the classical Physics towards the microworld that considerably enriched scientific knowledge and gave the society the nuclear energy and Nanotechnologies.

In the methodology of the higher level, this or that phenomenon is considered out of any scientific discipline. At the same time "exit" is directed towards the macroworld. Each fragment of this world, environment, any area, having natural physical and/or logical borders is initially considered as "the ordered environment", to research of which it is possible to apply the same principles, approaches and models.

The term "transdisciplinarity" and its first definition as the placement of the interdisciplinary relations in the global system, without strict borders between disciplines. This definition was offered by J. Piaget (2001) in 1970. Now the transdisciplinary approach has received "registration" in the system of scientific methods, applied in various fields of knowledge. In modern science there are four types of the transdisciplinarity (Judge, 1994):

– transdisciplinarity-1, is based on efforts of formal interrelation of understanding of separate disciplines, it provides formation of a logical meta-framework by means of which, their knowledge can be integrated at the higher level of abstraction, than it occurs in the interdisciplinarity. It is also often used during the work of various expert systems and expert groups;

– transdisciplinarity-2 has more close internal connection with personal experience of the researcher, including meditation;

– transdisciplinarity-3 is connected with the use of general metaphors having fundamental cognitive value;

– transdisciplinarity-4, its methodology is a way of understanding, knowledge and description of an object as a part of the United ordered environment; a way of management of the state (harmonization) of an object and the natural habitat; it is implemented in 2 directions – obtaining new knowledge on the world around, searching for the solution of complex multifactorial problems of the nature and the society. The basic principle is the concreteness of the truth that causes the united order, the transdisciplinary system is presented by spatial, information and temporal units of this order.

It is pleasant that in the national science there is the Russian school of the transdisciplinarity, which allows to maintain the existing positions and competitiveness in the world science. The first theoretical works on philosophical aspects of the transdisciplinarity appeared in Russia in 2004-2005 (Kiyashchenko, 2009). In 2007 the independent noncommercial organization "Institute of Transdisciplinary Technologies" was established. Its main objectives are further development of the transdisciplinarity as an independent academic discipline, introduction of solutions of the complex multifactorial problems of methods and technologies of the transdisciplinary approach. Among the contemporary scientists the works of N.V. Manokhina (2005) and T.E. Stepanova (2012) are devoted to this problematics. However, for 20 years of work, it was found out that the majority of the developed transdisciplinary technologies and the technological ideas prepared for practical implementation, have "dual purpose". This caused selectivity of publications on separate themes in the public media. By 2013 several main branch directions were developed. In these directions is the best practical implementation from the perspective of the trandisciplinary approach – economy, ecology, education, health care (Lawrence, 2004), architecture and construction, preventative measures from of antisocial and terrorist danger.

Conclusion

The transdisciplinary approach not only enriches the scientific knowledge, but also allows to develop new management technologies of macro objects and macroprocesses, including management of the general state of objects of the nature and the society, management of the general state of a man and a difficult technical object, creation of ways and technical means of receiving and processing of information, etc.

The authors represent their strong contribution to development of not only theoretical, but also applied aspects of implementation of the transdisciplinary approaches in the modern economic researches.

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No potential conflict of interest was reported by the authors.

Notes on contributors

Tatiana E. Stepanova is Professor of Samara Institute (branch) Federal State Budgetary Educational Institution of Higher Education «Plekhanov Russian University of Economics», Samara, Russia.

Nadeghda V. Manokhina is Professor of Saratov Socio-Economic Institute (branch) Federal State Budgetary Educational Institution of Higher Education «Plekhanov Russian University of Economics», Saratov, Russia.

Maria E. Konovalova is Associate professor of Samara State University of Economics, Samara, Russia.

Olga Y. Kuzmina is Associate professor of Samara State University of Economics, Samara, Russia.

Lyudmila M. Andryukhina is Professor of Russian state vocational pedagogical University, Ekaterinburg, Russia.

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