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Application of System and Synergetic Paradigm of Management of Social-Economic, Educational Processes in Ukraine

Застосування системної та синергетичної парадигми управління соціально-економічними, освітніми процесами в Україні

Завдяки розширенню системної та синергетичної методології у сфері соціально-економічних досліджень, синергетична методологія екстраполюється на управління соціальними та економічними процесами на рівні побудови моделі такого процесу. Дослідження послідовно проводиться на трьох методологічних рівнях – загальному (загальні принципи синергетики реалізуються в соціально-економічній сфері), особливому (загальні принципи синергетики реалізуються в управлінні соціально-економічними системами) та одиничному (синергетичні принципи управління соціально-економічними системами реалізуються у сфері освіти на рівні моделі управління навчальними системами з використанням тимчасових саморегульованих управлінських цільових команд). Встановлено, що системно-синергетичний погляд на світ виявляє певні фундаментальні аспекти поведінки природних та соціально-економічних систем в контексті їхнього контролю та управління. Показано, що використання тимчасових саморегульованих управлінських цільових команд, що є основним елементом синергетичної моделі соціально-економічного управління, реалізується відповідно до синергетичних принципів та процесів.

Ключові слова: системна та синергетична методологія, загальні принципи синергетики, емерджентність системні (кооперативні) явища, природна самоорганізація, самодетермінізм соціально-економічних об'єктів, кібернетичний закон необхідної різноманітності, синергетичні принципи управління соціально-економічними системами, тимчасові саморегульовані цільові команди.

Due to widening the system and synergetic methodology in the sphere of socio-economic research, the synergetic methodology is extrapolated on managing social and economic processes at the level of constructing a model of such a process. The research is consecutively conducted on three methodological levels – the general/overall (general principles of synergetics are realized in socio-economic sphere), the peculiar/specific (general principles of synergetics are realized in socio-economic systems management) and the single/individual (the synergetic principles of socio-economic systems management are realized in the sphere of education on the level of the model of educational systems management using temporary self-ruled managerial target teams). It is stated that the system-synergetic view of the world reveals certain fundamental aspects of the behavior of natural and socio-economic systems in the context of their control and governance. It is shown that the use of temporary self-ruled managerial target teams, being the major element of a synergetic model of socio-economic management, is realized according to synergetic principles and processes.

Key words: system and synergetic methodology; general principles of synergetics; emerging and system (cooperative) phenomena; natural self-organization; self-determinism of socio-economic objects; cybernetic law of necessary diversity; synergetic principles of socio-economic systems management; temporary self-ruled managerial target teams.

Introduction.

The analysis of current socio-cultural situation in Ukraine and in the world enables to come to a conclusion that a new paradigm of socio-economic systems management is developing. This is due, first of all, to the exponential growth of scientific knowledge and widening the interdisciplinary investigations. Synergetics – one of the newest scientific areas – can be considered the leading branch of interdisciplinary research, whose phenomena are extended to all spheres of socio-economic life revealing the principle of self-organization in natural and socio-economic systems.

Historical background and analysis of literature.

Now we can be witnesses to a wide range of social studies based on the phenomenon of social energy [4; 7]. Some aspects of synergetic theory of self-organization from the socio-managerial point of view are reflected in the papers of the native (I. Ershova-Babenko, S. Klepko, V. Kushnir, V. Lutai et al.) and foreign (V. Arshinov, R. Benedict, V. Bransky, P. Bourdieu, V. Budanov, P. Checkland, J. Coleman, E. Fromm, H. Haken, E. Knyazeva, A. Maslow, A. Nazaretyan, S. Pozharsky R. Putnam, et al.) scientists who use the synergetic paradigm to analyze social, economic and, specifically, educational processes.

The phenomenon of social synergy has always been in the center of scientific attention. Originally, the synergetics as a newest branch of exact sciences was used by investigating the natural processes (autocatalysis phenomena by I. Prigozhin, laser radiation by H. Haken, etc). Later synergetic regularities in self-organization phenomena of physical, chemical, biological nature were extrapolated on the field of social and socio-economic studies, thus revealing the possibility of applying the synergetic paradigm in investigating socio-economic processes. One of the proofs of this was

H.Haken's article ("*Self-organizing society*") where the societies with high social synergy (characterized by consensus) were investigated [9].

H. Haken's ideas of self-organizing society stem from the teaching of social synergy developed by Ruth Benedict and Abraham Maslow [2; 13]. R. Benedict by investigating social cooperation in primitive communities, put forward the idea of *social synergy* being social and institutional phenomenon that fuses social differentiation based on people's selfishness and aggression. High social energy develops in people such social attitudes as altruism and mutual help. R. Benedict has showed that the societies with a high level of synergy display a low level of aggression among their members and a high level of cooperation, realizing high degree of trust, sense of responsibility, and minimal centralization [2]. A. Maslow has further developed the idea of social synergy applying this phenomenon to the individual behavior thus showing a certain correlation between high social and individual synergy and person's psychological health and social processes. A.Maslow has shown that in some primitive and modern communities with a high level of synergy there is an order in which the actions of the individuals, aimed at achieving their own profits, are beneficial to the whole society. There one can reveal a spirit of benevolence, a hope for the better; while in the societies with a low level of synergy one encounters the spread of horror, humiliation, uncertainty as for the future, there the success of one individual is due to the defeat of another. In the societies with a high level of synergy, power and wealth are equally distributed among the members of the societies; in the societies with low level of synergy, power and wealth tend to concentrate, being distributed very unequally [13, p. 191-200]. As P. Sorokin noted, when goods are distributed more or less in proportion to the merits of the members of the community, then this leads to an increase in community's social mobility and activates its dynamics [15], thus revealing the principle of social synergy.

This synergetic approach to studying primitive communities was applied by E.Fromm in his bestseller "*The Anatomy of Human Destructiveness*" [8]. V. M. Bekhterev, a natural scientist, wrote about a group energy, being in direct ratio with the mutual consensus of group's individuals. K. Levin has put forward a theory on "psychological field" having much in common with social synergy. V.P. Kaznacheev writes about the field, holistic-continuous factors of social life, being actual on initial stage of humankind's onto- and phylogenesis [10].

It is understandable that the principles of synergetics can be applied to the phenomenon of "*social capital*" – a concept in sociology, economics and political science, which denotes social networks and the relationships between them in human society. The notion of "social capital" was introduced by Pierre Bourdieu in 1980 to refer to social ties that can act as a resource for obtaining benefits [3]. James Coleman, in his article "*Social Capital in the Production of Human Capital*" (1988), proposed an updated concept about social capital as a public good being produced by the individuals with a view to subsequent getting the benefits. Thus the individuals are understood as free and rational. It is assumed that a social contract, social norms and social exchange are necessary for constructing social capital. The latter is impossible without a certain level of mutual confidence [6].

Later on Robert Putnam proposed a new structure of social capital: social norms, social ties and trust. The first two factors are essential socio-psychological attributes of an individual. Therefore R. Putnam measures social capital with the help of individual indicators, such as intensity and strength of social contacts, the participation in public associations, electoral activity, satisfaction with relationships, respect for the norms of reciprocity, a sense of security, trust in neighbors and social institutions. Then the group or territorial indicators are obtained through aggregation of the individuals [14].

An important transition from a qualitative discussion of the importance of social norms to a more substantive study was R. Putnam's monograph "*Making Democracy Work: Civil Traditions in Modern Italy*." Analyzing the results of the decentralization reform in Italy in the 1960s, R. Putnam drew attention to the fact that the northern regions, where people are more socially active (in terms of participation in different social organizations and an interest in local affairs), they took advantage of transferred powers; in the "passive" southern, on the contrary, the quality of management was decreasing [14].

Thus, the high level of mutual trust and understanding, cooperation and communication – all these make up the social capital of the community, and the better it is developed, the greater creative success this community is able to achieve.

One of the most promising mechanisms for increasing social capital and along with it – social synergy – is the *social system of exchanging services*, where the time spent on providing services can be used as money a person can earn, then being spent on the services he needs. The author of this social system is V. Livshits, who developed the first "bank of time" that was organized at the enterprise level – at the bread-baking complex in the city of Kohtla-Järve (Estonia) in 1977, which made it possible to flexibly use working time. After some time, the time exchange for services was used between three Baltic organizations. Thus, with the help of "bank of time", an exchange of services is realized, being assessed by the number of hours that people spend while working in certain services.

In the United States the first banks of time appeared in 1987, and subsequently began to spread throughout the world. In the post-Soviet space, the first bank of time began operating in Russia (2006), Estonia (2009), Ukraine (2010). It was called "DobroBank", and the time earned by the members of the bank was called "goodhours". Currently, a record number of time banks came into operation in Japan (about 800).

Creating a website of the "DoBroBank", the organizers assumed that students and the unemployed would be interested in the service of time exchange. As the practice has showed many citizens of active working age – from 25 to 55 years – are interested in this kind of working activities. The procedure of joining the time bank community is as follows: a willing person should register and fill out a questionnaire in which he indicates what he/she is capable doing and what he/she is willing to do for exchange to obtain necessary services. As we can see, such an exchange of services is not direct, but indirect – through the bank.

Objectives.

Taking into account the widening of system and synergetic methodology, it is particularly important to develop the main principles of this methodology in the context of social and economic management. Therefore, in today's socio-economic conditions, the extrapolating of a system-synergetic methodology on managing social and economic processes at the level of constructing a model of such a process is the objective of our article.

Data and methods.

Our research is consecutively conducted on three methodological levels – the general/overall (general principles of synergetics being realized in socio-economic sphere), the peculiar/specific (general principles of synergetics being realized in socio-economic systems management) and the single/individual (the synergetic principles of socio-economic systems management are realized in the sphere of education).

1. The methodological level of the general.

The system-synergistic approach to the management of socio-economic processes is based on specific categorical blocks we have developed by the adaptation of the

principles of synergetics to socio-economic reality. Let us consider these blocks.

1. Natural self-organization, self-determinism of socio-economic objects. Self-organization is a process or a set of processes occurring in the systems, it helps to support their optimal functioning, self-crystallization process, self-improvement and self-modification.

2. Unbalanced dynamics, fluctuations, the states of instability. Fluctuation/instability – is a constant change, deviation in systems' functions, thus revealing the state of unbalanced development of natural and socio-economic systems.

3. Chaotic processes. Chaos in the field of socio-economic systems management is appearing in the situations of uncertainty, the lack of a single solution and approach to decision making, to the problem situations, revealing unorganized and spontaneous aspirations of the subjects of a socio-economic system. Consequently, the concept of synergy and the synergistic approach in socio-economic management imply that chaotic processes should be taken into account.

4. Openness (dissipation) of socio-economic systems, their self-development, self-determinism. At the level of management of socio-economic systems, this means cooperation (partnership) of all parts of the systems stemming from implementation of the reflexive/soft principles [5], which are based on feedback ties between different management links.

5. Nonlinearity, bifurcation of socio-economic processes. The synergetic approach to the analysis of socio-economic systems implies the actualization of socio-economic processes as nonlinear situations, when the development of socio-economic systems is viewed as nonlinear, when, at certain intervals, bifurcation points (alternative possibilities of system's development) are revealed, due to which the process loses linear certainty.

6. Probability, randomness, multidimensionality of socio-economic phenomena. The synergetic approach to the analysis of the process of management of socio-economic phenomena guides the researcher to the multidimensionality, multicomponentity and polyphony (alternatives and variability) of management, helping to identify in it the hidden potential, probabilistic states, thus recognizing the great role of randomness in system's development. Randomness here is understood as the urgency of improvisation, intuition, the ability to change the entire scenario of management activity through seemingly random and minute events.

7. Attractors of socio-economic processes. Attractors are relatively stable possible states, in which the processes of evolution in open nonlinear environments unfold, when we can speak of certain precondition of the future state of the system, since it "attracts, organizes, forms, changes" its present state. In the field of managing socio-economic systems, the attractor may play a role of corresponding social order, which expresses the objective tendencies of social development.

2. The methodological level of the peculiar

The above made generalizations allow to state that the system-synergetic view of the world reveals certain fundamental aspects of the behavior of natural and socio-economic systems in the context of their control and governance.

1) The ruling factor in any system is the most dynamic and flexible element/agent of this system [17].

2) Any system that appears as an integral nonlinear open self-organized entity demonstrates systemic, emergent properties, to which the properties of individual elements of this system do not reduce.

3) These system's properties reveal the natural correlation of the parts of the whole system, which is manifested in the transition of the system from disorder (chaos) to

order. Thus, the synergetic effects of the system are manifested in the aggregate collective effect of the interaction of a large number of its elements, which leads to formation of the stable structures and self-organization in the system.

4) Vitality, homeostasis of any socio-economic system is expressed in the relationships of its elements, when the system function through the interaction of its elements, which implies, on the one hand, their hierarchy, and on the other hand – holographic reflexivity, when every element of the system is located and functions in connection with other elements thus due to system effect expressing a certain degree of completeness of the qualitative content of all system's constituents (revealing the holographic phenomenon).

5) The ontological integrity of the system is manifested in the fact that each of its elements at a certain time interval in a functional sense is absolutely valuable to the system, since the demolition of this element leads to a loss of system's integrity.

6) At the level of its integrity, any socio-economic system appears self-determined, self-organized entity, capable of unfolding an internal program of its development.

7) In the fluctuation states of its development, the system detects the response to ultra small signals of the environment (enabling to develop the technique of soft/reflexive management [5]).

8) The management of socio-economic systems is carried out at the expense of the resonant influences that direct the system to one of its own ways of development.

9) The development of natural and socio-economic systems crosses the hierarchy and dehierarchy (non- hierarchy) stages thus revealing the fluctuation processes (refer to fig. 1).

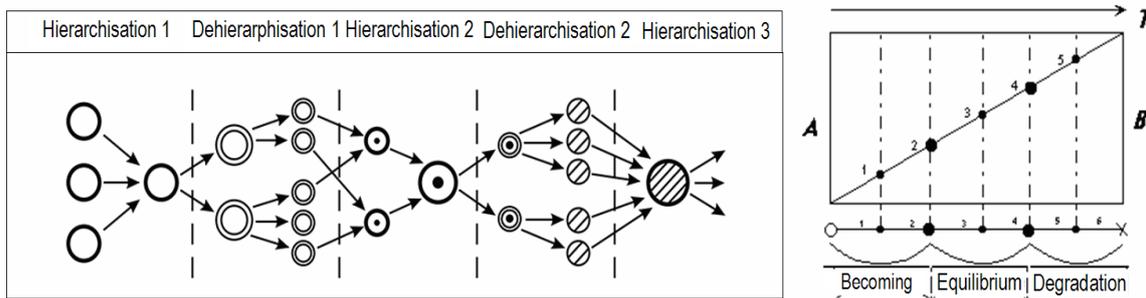


Fig. 1. Synergetic three and six phase models of development

In accordance with developed by W. R. Ashby (one of the founders of cybernetic direction of management theory) **the law of necessary diversity**, any system can function effectively only when it possesses the ability to change itself in response to possible outer disturbances. According to the above-mentioned law, the achieving of management efficiency presupposes the situation when the diversity of the controlling subsystem must be no less than the diversity of the controlled subsystem [1, p. 244-247].

The abovementioned management principles find some realization in the practice of socio-economic systems management: it is believed that the organization of a management functions in socio-economic sphere should be guided by the principle of decentralization of these functions, when only those functions are transferred to the higher level of management, that cannot be solved by the lower level of management, and vice versa.

It should be stressed that **integral unity of lower and higher managerial levels (subsystems) is obtained due to this interdependence and managerial functions interchange. But at the same time the diversity of the managerial subsystem of the**

higher level must exceed the diversity of the lower subsystem, which excludes abovementioned managerial function interchange leading to systems' self-determinism, self-government.

Another principal difficulty in managing social systems is connected with ***specialization and differentiation in socio-economic activities*** since it is known that in the conditions of such a specialization the productivity growth is realized by fragmentation of the works, functions, knowledge. And more specialized work also requires more managing efforts in coordinating socio-economic activities, which is carried out mainly by middle management staff. As a result, the number of managerial levels is steadily increasing, and each worker/clerk feels more and more alienating from his/her activities and its results.

It is clear that the path to excessive specialization turns out to be hopeless, so there is a need to create a mechanism of self-government that would carry out self-regulation "from below". Thus, ***the transition from a narrow specialization to integration in the character of the management activities must be realized.***

The abovementioned difficulties are solved by use of ***synergetic approach*** being applied in the sphere of social management. Let us dwell on this application.

1. The complexity of socio-economic systems determines such managerial strategy: as B.F. Lomov has showed in the article "*The personality in the system of social relationships*" (1981), the relatively simple problems are better solved by the groups with a centralized communicative grid, and complex ones – at the absence of this grid. Analyzing these grids it is important to take into account not only the number of information links (channels) of each participant in the group activity, but also the frequency of their use and orientation (whether there is a one-way bilateral communication).

2. Synergetic attractor must be oriented at the process of management decisions making: the process of socio-economic management should be system-oriented, problematic, which is typical of the developed countries of the world, when the development of socio-economic systems is implemented at the level of a certain number of targeted programs, which involves the joint work of various governing bodies of the state and enterprises. System-target problem planning is implemented according to the scheme "***goals → paths → methods → resources.***"

3. As we have noted, W. R. Ashby formulated the law of correspondence of the diversity of the controlling subject (the controller) to the diversity of the object being controlled. In accordance with this law the diversity or uncertainty in the development of a controlled object can be reduced due to the corresponding increase in the diversity of the controlling subject. Consequently, the matter does not lie in the quantitative increase in the functions of the controlling subject, but in its ability to neutralize the unintended consequences of the operation of the controlled object due to the targeting and accuracy of administrative actions.

Regarding socio-economic systems, this law has a limited effect, since the information base of the controlled subject is never exhaustive as for the variety and set of combinations of interactions that arise in the process of functioning of the controlled object and due to the unpredictability of the consequences of human actions. At the same time, in each case there is a necessary minimum of knowledge about the controlled object, which ensure the controlling functions of the controlling subject. The nature of the socio-economic object and the degree of its complexity play a decisive role in determining this minimum.

However, in systems with a high level of social capital, which we considered analyzing the socio-economic phenomenon of "time bank" associations, the above

problems are easily solved.

4. The interaction strategy of "time bank" associations leads to one of the simplest and simultaneously effective forms of system-target problem management – to ***matrix-synergetic coordination of the works***, which involves the creation of permanent and temporary committees (teams) to solve complex issues that arise in the development of the systems being controlled. This matrix-synergetic approach is characteristic of the innovative development of socio-economic processes management: the creation of ***permanent and temporary teams*** is implemented in Japan through the use of self-directed target teams, when specialists from different services (enterprise subdivisions) meet for specific tasks. In this way, the principle of narrow specialization of each worker is substituted by an approach in which a group of workers is responsible for a certain level/link of work.

In this case, the operations are reduced, and the number of operations performed on a separate specialized workplace, decreases from several hundred to several dozen, especially when the workers step by step gain the ***universal qualification*** in the process of their productive activities. In this way ***the problem of half-life of a specialist*** (when a modern specialist cannot keep up with the growth of new technologies and scientific knowledge, and this specialist is forced to grow in his profession) is being solved.

Thus, integrated (synergetic) operating productive systems are created where people and mechanisms can temporarily integrate into one unit, which makes it possible to greatly increase productivity. These units can be called ***temporary self-ruled managerial target teams*** (TSRMT).

3. The methodological level of the single

In our view, the analyzed aspects of socio-economic management, due to their systemic-synergetic nature, are quite appropriate to be used in the field of management of ***the systems in educational field***. It is important to note that the functional links of the elements of a TSRMT can be both vertical and horizontal, and form different functional configurations within the boundaries of certain temporary functional relationships, whose time limits can extend from one day to several years, which presupposes the involvement into management activity several TSRMTs, when such teams can form a complex spatial-temporal hierarchical organization.

Results.

So, according to step by step scheme ("goals → paths → methods → resources") we can organize several TSRMTs – in fact a system of TSRMTs where a reflexive and monitoring TSRMT is required to trace relevant socio-economic processes at various managerial levels – at the levels of both the state as a whole and its separate territorial subjects (including all-state, regional, district, territorial communities levels). At the level of reflexive and monitoring TSRMT (refer to fig. 2) it is advisable to create special monitoring methods (programs) that could be used to analyze the data obtained by the analytical and prognostic as well as managerial and executive TSRMTs.

At the same time, the managerial actions of the participants of these teams are implemented on the basis of the cybernetic-synergistic principle of cooperative action, according to which, in the process of combining the elements of management systems (TSRMTs), they create an emerging effect of the system, when the properties of each individual element are not reduced to the so called "system properties" of an integral system.

This concerns not only systemic but also procedural administrative aspects. Thus, we can talk about well-known methods of cooperative learning and management, when the ability to cooperate, that is, the procedural interaction, is actualized in a person when he faces the need to solve very complex tasks that can not be individually solved. And this

requires the recourses of another person with a view to involving this person into co-operation. So, the starting point in the technology of cooperative (synergetic) management of socio-economic (educational) processes is associated with involving of each member of the management team to joint activities: such a need for synergetic activity arises due to the need for communication and exchange of specific knowledge, skills for obtaining integrative results of management activities.

In this process it is expedient to use already known methods of team interaction when the TSRMTs are formed in such a way that they have "leader", "generator of ideas", "functionary", "opponent", "researcher" etc. At the same time, any leader can be replaced after a certain period of time, which gives such teams a creative dynamics and self-organization (refer to great pedagogue A.S.Makarenko's temporary working teams presupposing constant shuffling the members of these teams and their leaders).

Generally one can talk about different hierarchical levels of TSRMT, which can be combined with each other according to the above-mentioned cooperative-purpose principle in order to solve certain managerial problems. We present a figure that illustrates the model of management of social systems on the example of managing educational processes and systems (Fig. 2).

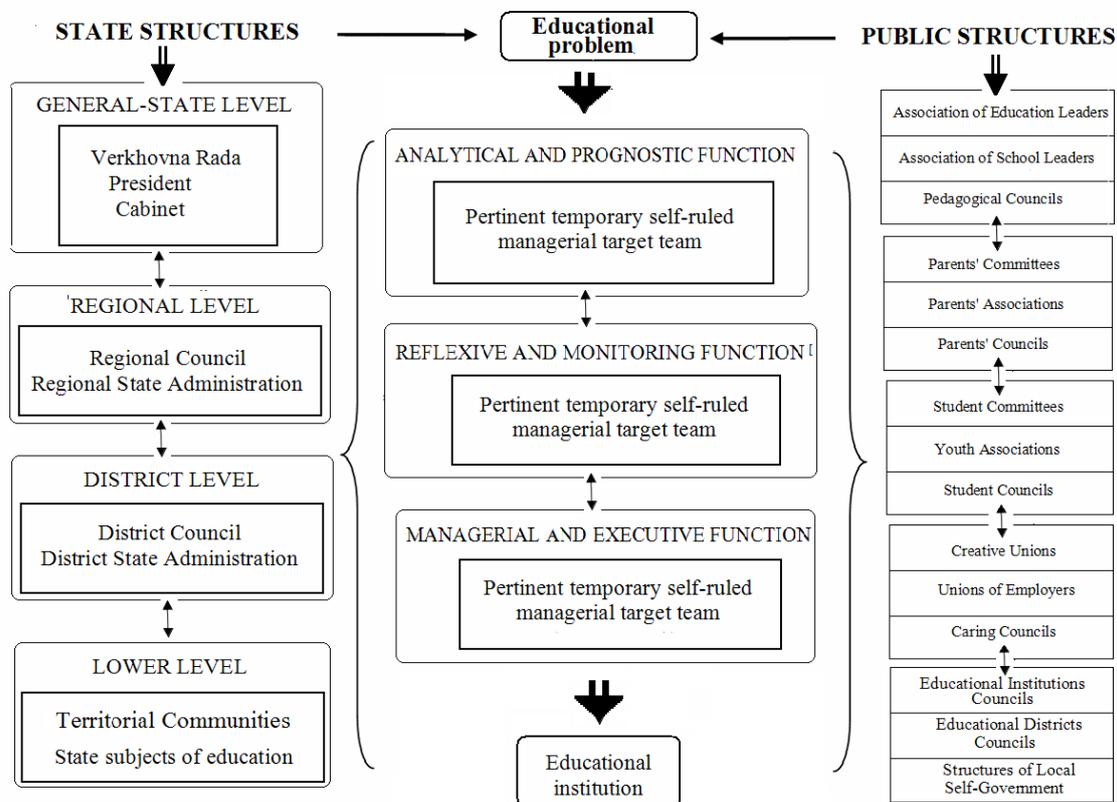


Fig. 2. The synergetic model of educational systems management using temporary self-ruled managerial target teams

Conclusions.

Thus, the conducted analysis allows to assert that management of the educational systems should be carried out by means of TSRMTs, which members are recruited from state, public structures and a concrete educational institution. The latter is the subject who receives a task/target to resolve a concrete educational problem stemming from social events initiated by different social systems expressing a certain social order.

The *mathematical algorithms* of functioning synergetic phenomena (including the

educational systems) is given in our article [16] "The analysis and synthesis of critical phenomena and quantitative modeling of their kinetics from the position of two-dimensional scaling of bifurcation points".

At the same time, the use of TSRMTs is realized according to above mentioned synergetic principles and processes:

1. By using TSRMTs we gain synergetic effect consisting in emerging and system (cooperative) phenomena.

2. The teams are created quite spontaneously due to new educational (social) problems thus quickly reacting at outer environment's disturbances. In this way, the teams can be considered to be open (dissipated) self-determined systems.

3. The management capacity of the teams stems from their flexibility, multi-targeted nature and staff complexity since the members of the teams are recruited from various strata of society.

4. The activities of the teams due to their diverse staff is quite unpredictable – that is, synergetic, chaotic, creative, nonlinear.

5. Due to complexity and diversity of the teams they can react at different social fluctuations including the weakest signals of social and economic environment.

6. The teams are quite self-determined and creative units since their temporary staff is recruited from different socio-economic establishments; so the teams' members are not strictly fixed and are not materially dependant on team's activities which gain creative character: one of the major characteristics of creative activities is connected with non-pragmatic orientation of the person involved in creativity thus revealing non-adaptive modus of a creative artist working according to the principle "the art for the sake of the art").

The prospects for further research.

The above made conclusions require further in-depth theoretical and practical research in the context of approbation of the system-synergetic paradigm of management of educational systems based on the activity of temporary self-ruled managerial target teams.

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