
Organizational and Financial Modeling of Transnational Industrial Clusters Sustainable Development: Experience, Risks, Management Innovation

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Abstract:

The article is devoted to a research of current trends and priorities of organizational and financial modeling of sustainable development. The experience of transnational industrial clusters formation and development is the object of the research. In this article authors conduct a research of the opportunities for sustainable development strategies modeling in the context of new phenomena and precedents, demonstrated by global economic system and revealing in convergence of risk events and divergence of their assessment: new phenomena, properties and characteristics of economic systems, important for the management systems modernization with the purpose to resolve problems of their theoretical and methodological support, had been analyzed; and as a result the method of system and diagnostic analysis, oriented on proactive modeling of management systems competitive performance, was proposed.

The authors came to conclusion about the need to include system and diagnostic analysis in the methodological basis of social and economic systems management theory, including all forms of business entities in the industry. The stated improvement of management methodology will form instrumental and methodical apparatus of a new economic growth strategy modeling. Thus, the restructuring of the Russian economic system should be carried out considering the objective need to bring its organizational and financial model to the form of hyper-network super-system, which will enable preventive modeling and testing of the process of all sectors and clusters integration, maintaining a positive synergetic effect. As a result the authors concluded that the development of transnational industrial clusters should be conducted as a part of the adaptive stability provision concept, which is achieved by applying system and functional analysis as a methodological basis for organizational and financial modeling.

Key Words: *Management, industry, corporate finance, financial strategy, organizational and finance modeling, sustainable development*

JEL Classification Codes: *G30, G32, O16, O25, C45*

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1. Introduction

The purpose of this research is identification of valid methodology of the organizational and financial modeling of management systems of industrial clusters sustainable development, including transnational, in the context of new effects and phenomena revealed in the last decade by the global economics. In modern conditions the issues of providing sustainable development not only in industry as a major producer of value added, but also in entire regions, national and transnational clusters, meso-regional economic structures at the global level become actual (Faizova *et al.*, 2015; Theriou *et al.*, 2014; Theriou and Aggelidis, 2014; Theriou, 2015; Havlíček *et al.*, 2013). At the same time in modern scientific thought the divergence of views both on definite content and on methodological basis and instrumental and technological support of sustainable development of social and economic systems of various scales is identified. This naturally leads to the need for a deep theoretical study of the underlying causes and finding possible directions of leveling the identified dysfunctions. In this regard, the authors analyze and systemize new phenomena, properties and characteristics of economic sphere, which are not reflected functionally in management theory and methodology; analyze definite content of the "sustainable development" category from functional point of view for management theory, provide an assessment of new risks arising as a result of risk events convergence with simultaneous divergence of their assessments; give the results of evaluation of financial potential of the corporate structures of the Russian transport and industry complex; and as a result the authors formulate proposals with regards to the necessary directions of modernization and improvement of organizational and financial modeling methodology.

2. Theoretical, informational and empirical, and methodological grounds of the research

The research is based on theoretical grounds, formed on the basis of management theory quantitative school postulates, institutional theory, theory of systems, theory of network economics, organizational management theory, school of philosophy of economics, financial economics concept, financial globalization theory, modern concepts of uncertainty theories and risk management. The methodology of the research, in addition to general scientific research methods, is represented by system and diagnostic analysis in terms of the system and functional approach, methods of self-learning artificial neural networks modeling, group of fuzzy sets theory methods, financial diagnosis methods (Allegret *et al.*, 2016; Thalassinos, 2007; 2008).

Information and empirical basis of the research were the materials formed as a result of monographic review and analysis of scientific and periodical publications represented in international electronic libraries, as well as authors' own calculations on 90 Russian transport and industrial complex companies, number of which is included in the international transport and industrial clusters (Sibirskaya *et al.*, 2016;

Ryzhkova *et al.*, 2015). Management theory in the late XX - early XXI century received significant development due to the fact that it was included in number of objects of management of such systems and elements that previously were not managed directly: organizational capital, human and intellectual capital, business reputation, level of customer loyalty, etc. At the same time, even application of new and improved methods of management under the conditions of the current economic dynamics is increasingly failing to achieve their goals: for example, organizational optimization and subsequent business organizational restructuring showed low efficiency due to the preservation and restoration of the majority of inefficient business processes under the influence of QWERTY-effects and Path Dependence; the effectiveness of human capital management systems is limited by the absence of relevant management systems of the achieved results; when implemented all the KPI systems demonstrate the transition to formalization of the targeted values achievement procedure at the expense of changes in planned and actual values, etc. This clearly demonstrates the fact that at present stage the management systems modeling process itself becomes the task of the most complicated intellectual work, which is conditioned by the transition of the world economic system to the age of swift changes, regularly producing uncertainty in local environment even having advanced information transparency.

3. Results

The authors identified a number of properties and effects of the global economics, which are not considered not only in the classical management theory, but even in its modern schools and concepts. The number of the identified properties includes the following.

1. *Hyper-network super-systematicity.* Development of financial globalization and appearance of financial economics produced development of huge amount of network organizational forms, which was bound to be reflected in modern management concepts. At the same time convergence of networks, their uniting in hyper-networks has led to the loss of management instruments functionality due to changes in the properties of the objects of management: in hyper-network super-systems not only the definition of the controlled object external environment is distorted, but also its properties, characteristics and laws of development. In addition, in the network complex objects of management the network effects increase substantially, both positive and negative. It should be noted that this thesis does not contradict the institutional theory in terms of the purpose to minimize transaction costs and satisfies the Austrian school opportunity costs theory postulates; however it has completely new impact on the abilities of the known control systems. This results in the demonstration of the next property.

2. *The increase of negative network effects volume in hyper-networks.* From a management perspective, network structures require much less managerial efforts in view of the network effects existing. Network effects can be positive or negative.

When the negative network effects appear in the hyper-network, their distribution occurs at high speed. Identification of negative network effect occurs mostly in case there is a fact of the network functioning failure; however in the hyper-network even a single failure in one of the networks of the lower order can lead to irreversible changes in the whole hyper-network. More complex case is the manifestation of negative network effects, which do not lead to obvious failures in the network functioning, but at the same time change its targeted functions. The outcomes of this process can appear in different combinations, ranging from reduction of the hyper-network functioning efficiency to losing its controllability and transformation into a new network with a new purpose (Kovalenko *et al.*, 2016; Frank *et al.*, 2016; Stroeva *et al.*, 2015; Thalassinos and Liapis, 2013).

3. The convergence of different types of risks and the divergence of their assessments. To achieve the purposes of sustainable development, the most essential element of the management systems is a subsystem of risks management. The genesis of the risk management concepts and the corresponding instrumental and methodical apparatus demonstrates the complexity of procedures of identification, parameterization and risk quantitative assessment. The effect of the accumulation and instruments of its prevention and correction are widely presented in researches devoted to insurance and non-insurance risks correction. Risks convergence effect is not presented in theoretical works, however in a number of applied research the trend of risk management system changes in the direction of their mapping can be observed, which, in our opinion, demonstrates the need to study the phenomenon of risks convergence and development of the appropriate instruments of their management.

4. Transparent non-transparency. Virtualization of most of the business processes, caused by "digital revolution", has led to formation of digital projection of developed economic systems. Information technologies in all their multiplicity allowed increasing significantly the speed of business transactions, at the same time setting new standards for business processes of remote communication. This in its turn formed unprecedented layer of metadata, the pace of which growth is increasing in the course of time. Development of analytical technologies and decision support systems also demonstrates a new quality dynamics, for example, in terms of robotic automation of analytical technologies. At the same time the metadata processing requires firstly presence of the developed computer-based network systems; secondly it more often leads to the subjectivization of the received results; and thirdly almost always it is accompanied by the access privileges. Organizational capital of the economic entities in terms of information, network and computer technologies has become a necessity, and when it is not functional (regardless of its reasons) the significant information asymmetry is manifested. Thus in the process of total electrification, the transparency acquires occasional rendering: presence of data, access to this data and technologies of their processing is not relevant to the transparency of the investigated phenomena and processes.

5. Transition to the age "of swift changes". The foregoing properties result in a new quality of the world economic system - increasing speed of multidirectional changes. For the purposes of management systems modeling this means the need for a transition from discrete to continuous models, as the appearance of the time lags in monitoring, analytics and communication leads to a loss of managerial potential and distortion of the idea about the actual state of the managed object due to the latency of many sub-processes in view of their virtualization. This means that management systems must be modified if not proactively, then at least together with the object of management.

Due to the impact of virtualization and financization of the economic environment the exponential growth of positive and negative network effects, leading to the formation of fundamentally new uncertainty, which can be in general described as "transparent non-transparency" and "moderated uncertainty", is observed. As a whole the described circumstances allowed a number of the respected researches using the term "turbulence" to describe the type of economic dynamics. Thus Dobrocheev O.V. back in 2001 indicated abnormalities of forecasting and dysfunctionality of existing prognostic apparatus, which later resulted in the economic turbulence concept formation, which was further developed by Dobrocheev O.V. and Klepach A.N., marking the dominant influence on the growth of the hyper-network structures spread turbulence (Dobrocheev O.V., Klepach A.N.). Professor Osipov Yu. M. noted the change of the world order itself and its principles, which leads to the need of changing the paradigms of economics (Osipov Yu. M.).

In 2009 the Chaotics concept, represented in the joint research by Kotler F. and J. A. Kaslione "Chaotics: the art of management and marketing in age of turbulence" (Kotler F., Kaslione J.A.), appeared in the methodology of management. A distinctive feature of the concept is the hypothesis about the need to consider, adopt and use productively the factor of the managed object instability for the purposes of its continuous improvement.

Following on from the ideas of F. Kotler, J. A. Kaslione and N. Taleb, we consider it possible, necessary and appropriate to introduce for scientific use and to the management theory the definition "adaptive stability", which appears as essential property of the object of management for provision of the sustainable development goals achievement. Adaptive stability appears as a specific reaction to stressors, leading to the improvement of functional properties and characteristics ("viability" raise) of the object of management. Without achievement of adaptive stability state it is not possible to implement the suggested by foreign researchers Chaotics Management System® under the conditions of economic restrictions, sanctions, unsustainable growth (i.e. turbulence) due to the high level of managerial costs. Based on identification of new effects of the global economics and fixation of dysfunctionality of theoretical and methodological apparatus of the management theory, the authors concluded that the current stage of the global economics

development, with its usual high level of consumer markets development, shifts the area of competition from the product level to the level of management models: namely management models provide competitive advantages of business entities at all levels of economics from nano- to mega. New properties, showed by the objects of management under the influence of convergence and accumulation of unprecedented risks, require detailed study both themselves and in all the variety of existing and potential combinations of their interrelation (Andreeva, 2015; Liapis *et al.*, 2013).

The most widespread management methods and instruments are based on retrospective analysis, which significantly limits the possibility of the proactive management models formation, preserving their functionality in conditions of the age of swift changes and its common uncertainty. Analytical and prognostic work as a part of making management decisions should be no longer limited by standard methods, first of all because risks in modern economics are more often subject to the effects of accumulation and convergence, which, in its turn, requires using not only systematic approach, but system and functional approach. Modern system and functional approach requires forecasting options to be included in the system of management decision-making and development of management tools and methods, currently oriented not on the past or actual state of the managed object, but on its future state in future conditions, which is a regular consequence of the economics virtualization, and at the same time the reason of its further growth.

The uncertainty of the external environment requires from business entities a fundamentally new approach to manage internal business processes uncertainty. The decomposition of business processes, which was a trend of management theory in 2008-2015, under the conditions of growing of economics hyper-systematicity and the corresponding stage of organizational transformations, has led to blurring of the business processes holders significance, which was bound to affect the formalization of complex systems management.

Moreover, this gave occasion to the institutionalization of the process of transfer competencies of adoption of process managerial decisions to the highest levels of the management hierarchy, i.e. in fact to the level of the project management. As a result, the main unresolved problem of modern management theory is a methodological contradiction between the project and process management: in accordance with the accepted management theory postulates, the project management is oriented on formation of future targeted state of the object of management, and the process one on achievement of the management goals at the operational level. Recent experience has shown that economic entities more often allow mixing and simple compilation of the project and process management goals and tasks, which inevitably causes, at its best, the loss of efficiency and, at its worst, the loss of controllability.

The study of 90 Russian transport and industrial complex companies, using financial

diagnosis methods, has shown that:

- 76% of the studied companies moved in terms of ROS from positive phases of the companies lifecycle ("childhood", "growth", "maturity") to negative cycles ("recession", "aging"), as a result of the geopolitical risks expansion and their implementation in the form of currency risks and limitation of access to liquidity;
- 90% of the studied companies have WACC value below the level of the key rate, which makes them unattractive in terms of investment;
- 38% of the studied companies have a high debt burden at the expense of short-term sources of finance;
- 12% of the studied companies implement joint investment projects with foreign partners, initiated before the crisis of 2014-2015, and it is these companies that demonstrated a high adaptability to negative dynamics of the business environment, enabling them to increase ROS, ROE and WACC indicators.

Analyzing the received data of financial diagnostics, the authors concluded that change in financial condition of the selected companies indicates the management system dysfunctions: it can likely be stated that the project goals do not seem significant for process managers of the studied companies, that on the one hand leads to formalization of the targeted indicators; and on the other hand to the fact that dysfunctions of process management are rarely taken into consideration in the management of the project, which again leads to a loss of the desired positive result. In the economics of swift changes it is not possible to wait for "self adjusting" of the stated management levels due to the exponential growth of alternative costs.

From this perspective, preventive modeling of the management system itself prior to project research and development should be implemented into the managerial process of any company, regardless of its legal form and business scale. The most important task of intellectual analysis in the modeling process is a validation of the management system. By validation we mean reconciliation of functionality of instruments, methods, management system technologies in achieving a definite goal. In this context, let us carry out the differentiation of validation with verification and assessment of the management systems effectiveness: the management system verification allows estimating if the definite planned specific tools, mechanisms and techniques have been used; the effectiveness assessment supposes comparative qualitative and quantitative analysis of cost on the implementation of management systems in the process of achieving a definite goal. Currently the definition of "validation" is applied mainly for the man-made management systems. In our opinion, the practice of using the term for the assessment of the accuracy of the management systems functioning in the social and economic environment should be expanded.

4. Conclusions and recommendations

The purpose of speeding up economic growth in the euro area and Russian economics is implemented in the formulation of the tasks of realization of the set of

major transnational transport and industrial complex integrated projects, and the main purpose is their integration into the evaluative economic hyper-network super-system capable to produce positive network effects.

Large projects in industry and transport, which appear as complex systems, demonstrate a changeable level of tolerance to the known management models, methods, instruments and mechanisms, which is conditioned by the foregoing effects and properties. Existing instrumental and methodological apparatus of management and best practices of major projects demonstrate the need for modernization of the management methodology under the conditions of increasing uncertainty: convergence and accumulation of economic environment risks require the integration of project and process management for the purpose of leveling the facts of loss of projects controllability and their cost-effectiveness. Considering the stated unresolved contradictions of project and process management, it is necessary to introduce the implication of continuous organizational and financial modeling of industrial systems, relevant to the specific character of the transformation of the properties of the objects of management in terms of various types of the environment dynamics. The analysis of the "sustainable development" definition, conducted by the authors, allowed making the following conclusions and generalizations about genesis of the sustainable development definition:

1. The definition of sustainable development originally had and continues to maintain interdisciplinary character;
2. There is a wide divergence of sustainable development interpretations; at the same time inadmissible convergence of the objects of management is observed;
3. The researches of sustainable development in modern Russian science trend to its fragmented interpretation outside the methodology of the systematic approach, which levels their value for the project management;
4. The main problem of sustainable development management becomes the absence of common measures and metrics of balancing economic, social and environmental goals, which leads to dysfunctionality of existing interpretations and definitions, as well as the proposed management instruments and technologies;
5. The most of the interpretations of sustainable development come down to the need to implement long-term scenarios and the corresponding systems of long-term planning, which is almost impossible to implement in modern conditions;

In the latest research it is possible to observe a trend to an analysis of the risk load of the objects of management and to financial determinism in the part of selecting measures and metrics: from 2016 the researchers more often define sustainable development in the parameters of financial stability, capacity and effectiveness of social and environmental responsibility programs, which expectedly leads to the actualization of "responsible investment" and "transformative investment" problems. A promising method for modeling the management system in large projects in industry is the system and diagnostic analysis with the included module of the optimization analysis. Unlike other existing methods, the system and diagnostic

analysis is oriented on the identification of problem making contradictions in perspective management model, but not on the actual failures, caused by them. This, in its turn, allows determining the specificity and dysfunctions of the managed object, as a result of which it becomes possible to form an effective, verified and valid management system.

The suggested innovative method of the system and diagnostic analysis includes a number of successive stages with relevant decomposition of their elements: identification of problem making contradictions, analysis of the external environment of the object and management, assessment of its stability type, definition of problem solving purposes, criterion signs of their achieving, choice of the method and strategy of object functioning, the choice of organizational structure, development of organizational mechanism, testing of the object for tolerance to the management system, integration. The advantage of this method is a proactive approach and the possibility to ensure the competitiveness of the management system and the underlying model, as well as the possibility of long-term conservation of these competitive advantages.

Currently success of any project management is defined by quality of the management model itself, which, in its turn, determines the configuration and topology of organizational and financial capital. Considering that global economics at present stage is characterized by increasing uncertainty, the international investors are beginning to move away from purely speculative strategies and show interest to projects in the real economic sphere. The greatest attractiveness is promised by new infrastructure projects and market potential of adopted territories provided by them. Topology of infrastructure projects requires investors to take into consideration regional specific not only by itself, but in dynamic relationship with global trends and tendencies. So, the most important euro zone competing infrastructure projects are more exposed to geopolitical risks, which are almost unpredictable in terms of probability and potential damage. This causes shift of investors' interests to the east; however together with financial flows the geopolitical risks can be distributed in addition to this area: in the struggle for new sources of economic growth the developed western economics are not ready to give loyal priority of investment attractiveness to the new Euro-Asian players. From this perspective, modeling of systems of financial support of major infrastructure projects should be initiated from the most detailed analysis and formation of maps of potential risks (including unprecedented), and completed by development of hybrid financial instruments with active involvement of various hedge forms.

Considering the foregoing properties, phenomena and characteristics, the process of organizational and financial modeling of transnational industrial clusters should include the following stages: 1. Identification of the area of international projects participants interests convergence. 2. Financial diagnosis of the desired parameters of the project. 3. Formation of a risk map. 4. Proactive stress testing. 5. Correction of problem making contradictions. 6. Development of complex hybrid financial

instruments. Preventive modeling supposes finding a balance of interests, the formation of an expanded map of existing and potential risks, development of organizational form (model) of the project implementation, the development of the corresponding financial model and financial mechanism. Proactive testing supposes testing the stability of the project and its components, the level of its adaptability, degree of financial flexibility, possible variability (Andreeva O.V. 2014).

Hedge instruments in modern conditions should be selected only after preventive modeling and proactive test, because it is these two stages that are able to form an idea about functional variants of hedge technologies. I.e. development of instruments of hedging risks of major infrastructure projects becomes not technologized standard operation, but moves into the status of the resulting component of financial engineering. The described procedures provide a risk orientation of financial strategy for the implementation of major infrastructure projects, namely: accounting and leveling of typical risks, identification of unusual risks, highly intellectual cognitive mapping of risks, financial parameterization of possible risk outcomes, proactive modeling of criteria, indicators and assessments.

Technologies of financial engineering, which were applied successfully for many years in the share markets and commodity exchanges, start being distributed systematically into the real economics sector. Leadership in modeling of financial instruments, optimized in correlation of risk and return, in order to ensure the implementation of major transnational infrastructure projects, can provide in addition organizational leadership in meso-region of the global economics: the organizational and financial network of infrastructure corridors development implementation projects support provides an advantage in implementing new topological strategies, which causes the strengthening of member countries positions and increasing the investment attractiveness of the projects initiated by them. Thus, financial parameterization of transnational industrial clusters should be conducted in line with the new methodology of financial management using instruments of financial diagnostics and financial engineering to provide united scheme of incomes and risks between the project participants.

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