

Parity of innovation and digital economy in the Russian management system

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Abstract – The article discloses the causes of the unstable state of the Russian economic system and the necessity of formation of an adequate control system. The control system adequacy is based on its ability to maintain parity of innovation and the digital economy, providing for the synergistic effect in order to achieve the maximum stability of the Russian economic system. The definition and the theory of innovation economy is provided for, linking the main function of the economy and the ability to make productive use of competitive advantages. Being oriented to structural stability, the control system should combine a set of the interrelated and ordered, in a certain way, elements of the innovation economy. The essence of the digital economy, associated with a functional component of the stability of the Russian economic system, is disclosed. The article provides for the methodology of parity of innovation and digital economy in the management system, taking into account the classical postulates of the functioning and development of the economic system. Parity of the innovation and digital economy in the management system is considered as a set of management functions that ensure the transfer of reproducible resources, with the formation of a new structural form. The methodology for assessing the parity of the innovation and digital economy in the management system, based on the analysis of dependencies of significant indicators of the vector function, is developed. The mechanism of ensuring parity of the innovation and digital economy in control system is offered, the important factors, range of recommendations, offers and instruments of implementation are revealed. The closed-cycle procedure of ensuring parity of the innovation and digital economy in control system having, consisting of the process of the analysis, the organization and control performed taking into account the laws and the principles of systematology, is provided for. The connection of the physics of the process of ensuring the parity of innovation and digital economics in the control system with the principle of Clasp Locker fastener is shown.

Keywords – *innovative economy, parity, management system, systematology, structural functionalism, sustainability, digital economy.*

I. INTRODUCTION

The unstable state of the Russian economic system is associated with the inability to recover in a timely and fully enough manner, to reflect the adverse effects of factors of the internal or external environment. This state is caused by the inconstancy of a complex of factors and parameters of interaction of subjects of economic relations that do not have sufficient stability to the preservation of reproduction processes. This condition is caused by uncontrollability of changes in the reproduction cycle, in which the exploitation of economic resources, the direction of investment, the orientation of scientific and technological development, the formation of personality and institutional changes are not consistent with each other and unable to increase the present and future economic potential.

Emergence of signs of unstable condition of the Russian economy is connected with the structural shifts, processes of restructuring of economy caused wear, change and expansion of the main capital benefits demanding long time and huge expenses for the production. Due to this, the stability of relationship between subjects economy is disturbed, the quality of interrelations between economic agents, ensuring the preservation of its integrity and stability is changing, striving for a new state of equilibrium.

The adequate control system fixing problems of structural and functional shift is necessary for implementation of purposeful process of ensuring stability of the Russian economic system. In this context it is necessary to correct control system for implementation of the principles of the innovation (Innovative Economy, IE) and digital economy (Digital Economy, DE), providing synergy effect for achievement of the maximum stability of the Russian economic system.

IE (knowledge economy, intellectual economy) is the type of economy based on the flow of innovation, constant technological improvement, the manufacturing and exporting

of the high-tech products with high added value. Alvin Toffler, John Naisbitt, Nana Naisbitt and Douglas Philips believe that it is IE that provides for the world economic dominance of the country, which makes it, in case of the most developed countries in the modern world (Chris Freeman, 1980) [1], (Richard Slaughter, 1996) [2], (Tracy Christofero, 1999) [3].

II. BACKGROUND

The theory of IE was created by the Austrian economist Josef Schumpeter at the beginning of the 20th century (Richard Swedberg, 2015) [4], (Nadide Sevil Tülüce, Asuman Koç Yurtkur, 2015) [5]. Schumpeter connected innovations: with creation of new goods with which consumers are not familiar yet, or new quality of goods; development of new method of the production which is not experienced in this industry yet which is absolutely not necessarily based on new discovery and can consist in new form of the commercial address of goods; opening of the new market at which the industry did not trade yet irrespective of whether there was this market earlier; identification of new source of factors of production irrespective of whether there was this source earlier or it was necessary to create again; creation of the new organization of the industry.

The modern "innovation" theory is getting closer to the main function of the economy. The main function of economy is to constantly create such benefits, which are necessary for life of people. The main economic function of IE is resource efficiency, which is fully disclosed in the competitive advantage concept (Louis Turner, 1991) [6].

Such look at the problem determines the identity of cost efficiency and ability to productively use competitive advantages (Can Huang and Naubahar Sharif, 2016) [7]. When choosing a criterion for assessing the competitive advantages of the Russian economy, it is necessary to determine its exclusive value due to the structural stability of its subsystems. General idea of exclusive value of the Russian economy, as structural stability of its subsystems connected with implementation of postulates of IE in control system. Structural stability oriented control system should combine a set of interrelated and in a certain way ordered elements of the economy, which allow to reproduce the economic and managerial relations, institutions in accordance with the postulates of the innovation economy.

The concept of "digital economy" (DE) was for the first time used in 1995 by Nicholas Negroponte, the American scientist from the University of Massachusetts [8], (Ewan Sutherland, 1995) [9] for explanation to colleagues of advantages of new economy in comparison with old in connection with snowballing of information and communication technologies (Information and Communication Technology, ICT) (Gerhard Illing and Martin Peitz, 2005) [10].

In the "Development strategy of information society of the Russian Federation for 2017-2030" approved in Russia [11] DE definition – economic activity in which key factor of production are data in digital form, processing of large volumes and which use of results of the analysis in comparison with traditional forms of managing the efficiency of different types of production, technologies, the equipment, storage, sale, delivery of goods and services allow to increase significantly is given. This definition does not connect with the functional role of the DE in the Russian control system.

For establishment of this communication, in the Digital Economy of the Russian Federation [12] Program the following definition of DE – economic activity, key factor of production in which are data in digital form, is formulated, and promotes forming of information space taking into account needs of citizens and society for obtaining qualitative and authentic data, to development of information infrastructure of the Russian Federation, creation and use of the Russian information and telecommunication technologies and also forming of new technology basis for the social and economic sphere.

DE is represented by the following levels, which in their close interaction affect the lives of citizens and society as a whole: the markets and the industries of economy (field of activity) where interaction of specific subjects (suppliers and consumers of goods, works and services) is performed; platforms and technologies where competences for development of the markets and the industries of economy (fields of activity) form; environment, which creates conditions for development of platforms and technologies and effective interaction of subjects of the markets and the industries of economy (fields of activity) and covers normative regulation, information infrastructure, personnel and information security (Maria Jose Sousa and Alvaro Rocha, 2019) [13].

General idea about need of implementation of DE is connected with the functional stability component of the Russian economic system. DE is the activity which is directly connected with development of digital computer technologies which includes also services for providing online services, both electronic payments, and Internet trade, and crowd funding and other (W. David Holford, 2019) [14], (Peterson K. Ozili, 2018) [15].

Modern conditions for development of the Russian economy bear in themselves the new restrictions in the choice and implementation of control system caused by transformation of world economic bonds, the "tough" competition for world resources, militaristic mood of series of states. The unstable condition of the Russian economy caused by these conditions dictates need for forming to adequate control system of the structurally functional stability, namely parity of the innovation and digital economy based on the principles.

III. METHODOLOGY

In the course of forming the parity of IE&DE in control system it is necessary to consider the classical postulates of functioning and development of economic system. Firstly, an economic system undergoes the influence of the external and internal factors causing functioning and development of various forms of a social system. Secondly, the economic system represents the complex (big) system which is characterized by variety of the subsystems (wide range of volatile and invariant external and internal relations) making it, existence of elements of self-organization. Thirdly, in various economic systems there can be serious differences in form of their relationship, motivations, requirements and the purposes, estimated measure of the allocated priorities and degree of importance.

At the same time the economic system is symbiosis of the difficult probabilistic dynamic subsystems covering processes of interaction of subjects of economic (IE) and the administrative relations (DE) in reproduction cycle.

It is necessary to express the structure of economic system caused by exogenous and internal causes in numerical form of logical interrelations of the subsystems creating. The system is characterized by existence of set of elements, bonds between them and also the complete nature of process of association of these elements. Marking out criterion of system, it is possible to predetermine essence of system research as sets of scientific problems which at all their specifics and variety are similar in understanding and consideration of the objects investigated by them as sets of the interconnected elements acting in the form of whole. On the one hand, system is called the physical reality in relation to which it is necessary to make decisions, with another – in the course of the system analysis the abstract and conceptual system described by means of symbols or other means which represents certain structural logic device, which purpose to serve as the tool for understanding, the description and full optimization of behavior, bonds and the relations of elements of real physical system is created.

IV. MATHEMATICAL MODEL

While setting priorities for economic development, it is required to determine the structure of the evaluated indicators, the system of restrictions, the executive function, the criterion of efficiency and the solution. Following main principles should be considered while forming the parity of IE & DE in the control system:

- systematicity - economic potential is considered as a system of interrelated elements (households, firms and the state);
- complexity - management is performed taking into account all external (exogenous) and internal (endogenous) factors;
- long duration - it is necessary to take into account the regularities of the strategic development of the economy and determine its parameters in the future;
- contingency - forms the requirement to consider the region as an integral part of the national economy;
- continuous variability – management decisions have property of temporality and are applicable only on limited period of time;
- counterintuitive behavior of complex systems of Forrester – selection of management decisions, is performed until it is not agreed with the ideas of the author completely;
- steady imbalance – the accuracy of management depends on degree of dynamism of the separate indicators providing development;
- sufficiency and partial balance – the choice of management decisions is performed taking into account extent of influence on IE&DE;
- compliances – it is caused by use of the principle of sufficiency and allows to use the revealed pattern of qualitative change of sufficient indicators for all economic system;
- optimality – the task is not in finding the solution it is better existing, and in finding the best solution from all possible;
- emergence factor – the principle of the system analysis expresses the following important property of system – the more a system is and the more the difference in the sizes between part and whole is, the higher is the probability that properties of the whole can strongly differ from properties of parts.

For systematization of process of forming of parity of IE&DE in control system two interdependent subsystems – IE and DE are allocated.

IE includes the following indicators: the innovation activity of the organizations; specific weight of the organizations which were carrying out separate types of the innovation activity in the total number of the organizations which were carrying out technology innovations; research divisions in the organizations which were carrying out technology innovations; volume of the innovation goods, works, services; volume of export of the innovation goods, works, services; specific weight of the innovation goods, works, services in sales volume in the internal and external markets; structure of export of the innovation goods, works, services; rating of results of the innovation activity; specific weight of the organizations participating in technology exchange in the total number of the organizations which were carrying out technology innovations; distribution of the organizations which were carrying out technology innovations and participating in technology exchange for the countries and regions; joint projects on performance of research and development of the organizations which were carrying out technology innovations; costs of technology innovations; costs of technology innovations on financing sources; specific weight of costs of separate types of the innovation activity in total amount of costs of technology innovations; the rating of sources of information for technology innovations; the rating of methods of protection of scientific and technical developments in the organizations which were carrying out technology innovations; the rating of the factors interfering technology innovations.

DE – research and development in the field of ICT, personnel of digital economy; ICT sector; sector of content and mass media; telecommunications; ICT use by the population; digital technologies in business.

IE creates the environment for effective use of limited resources and production (reproduction) of cumulative public product, using major factors of production. The cumulative public product should be considered as the synergy sum considering interference and complementarity of all material results of economic activity of the industries of production of goods in the region.

DE creates conditions for development of IE providing quality of life of the population, stimulates activity in innovation and investment and social spheres. It is necessary to consider the system principle of interdependent subsystems at which it is impossible to define the most significant, IE or DE – the priority is objectively insolvent. In this interaction of IE and DE there is high-quality adaptation of economy to new operating conditions and development.

The parity of IE and DE in control system is considered as set of the economic and administrative relations caused by transfer of the reproduced resources with formation of the new structural form capable to further development.

Let us present the imperatives of IE & DE parity assessment concept in the control system. First, the parameters defining behavior of system can be characterized two values: parameter size at present and its hodograph diagram (direction and trends of change). All parameters, on the one hand, are values, which have numerical expression; on another - they are the values with the direction, therefore, parameters are the vector values.

When describing a control system, it is required to apply the vector values. If to consider that each vector depends on

other vectors, then we receive some vector field described by matrix. At the same time, system – set of the elements which are in the relations and bonds with each other which form certain integrity, unity. Only then it is possible to recognize combination of elements as system when between them there are certain bonds.

The mathematical model of assessment of parity IE&DE in control system is based on the analysis of dependences of significant indicators of vector functions, according to the theory of structural functionalism.

$$IE \& DE(t) = F(\tilde{\alpha}_1(t), x_2(t), x_3(t), \dots, x_n(t), y_1(t), y_2(t), y_3(t), \dots, y_n(t), z_1(t), z_2(t), z_3(t), \dots, z_n(t)) = F_{IE}(t) \times F_{DE}(t) \quad (1)$$

$$F_{IE}(t) = F_{IE} \left(\left(\frac{X(t)}{X(t) + Y(t)} \right) \right) \quad (2)$$

$$F_{DE}(t) = F_{DE} \left(\left(\frac{Y(t)}{X(t) + Y(t)} \right) \right) \quad (3)$$

$$X(t) = \prod_{n=1}^N f_{x_n}(Z(t)_n) \quad (4)$$

$$Y(t) = \prod_{n=1}^N f_{y_n}(Z(t)_n) \quad (5)$$

$$IE \& DE(t)^* = \prod_{n=1}^N f_{z_{nn}}(x_n, y_n) \equiv \quad (6)$$

$$IE \& DE(t)^* = \prod_{n=1}^N f_{x_n}(Z(t)_n) \times \prod_{n=1}^N f_{y_n}(Z(t)_n)$$

where $IE \& DE(t)$ – surface of parity of IE and DE in control system; $F_{IE}(t)$ – efficiency of IE development; $F_{DE}(t)$ – efficiency of DE development; $Z(t)$ – the first factor variable – indicator IE&DE in certain t prior to a management decision making; – the second factor variable – logical dependence of a significant indicator IE on ; $X(t)$ – the first factor variable $Y(t)$ – logical dependence of a significant indicator DE on $Z(t)$ $Z(t)$; $IE \& DE(t)^*$ – parameter of IE&DE in certain t after a management decision making.

Search of set of possible decisions parity of IE&DE in control system can be performed with use of packages of application programs. For example, applying possibilities of the Microsoft Excel software product, by means of linear approximation, and using the Mathcad environment for stay value of parameter at which function reaches extremum in format of the set restrictions.

In the course of assessment of parity of IE&DE in control system it is necessary to consider compromise set of effective solutions (area of compromises or the Area of Pareto), and decisions belonging to it – effective or optimum according to Pareto (Yaning Lin, Xiushan Jiang and Weihai Zhang, 2018) [16]. The mathematical model of assessment of parity IE&DE is prototype of the measuring tool of the economic and administrative relations in the mechanism of ensuring parity IE&DE in control system.

V. MECHANISM

The mechanism of ensuring parity IE&DE in control system includes the studied characteristics reflecting distinguishing characters and properties of economy. Thereby, objective conditions for reasonable and harmonious

association of process of assessment and ensuring parity of IE&DE in control system are created.

In the course of assessment of parity of IE&DE in control system important factors come to light, recommendations are developed and offers are formulated.

The range of recommendations and offers on ensuring parity of IE&DE in control system includes: effective use of the IE resources and infrastructure of DE; improving competitiveness of high-tech industries due to regulation of mobility of production and creation of conditions for the innovation activity; growth of economic, social, institutional, legal quality of control system; forming of the legal IE and DE environment; approval of the program document creating main objectives, the principles and the directions of ensuring parity IE&DE.

Public foundations of assistance of implementation of the federal target programs based on the principles of public and private and cooperative and state partnership have to become the main tools of the mechanism of ensuring parity IE&DE; the federal target programs of development of IE and DE directed to the solution of problems of development of infrastructure, social and economic, resource and raw potential of economy; state monitoring of economic development; activities for accounting, collecting, analysis and synthesis of information of legal, economic, social and political character.

Procedures of ensuring parity IE&DE in control system are connected with explanation and formalization of organizational and target development of economic system, by means of determination of quality of internal bonds and also bonds with other systems and with external environment. Procedures of ensuring parity IE&DE have the closed cycle, and consist of the process of the analysis, the organization and control broken into seven steps:

1) the analysis of modern mathematical models for assessment and mechanisms of ensuring parity IE&DE, for the purpose of delimitation of invariability of typological image of the developed methodical tools;

2) development of mathematical model (technique) for assessment of parity of IE&DE on the basis of the system principles (holistic approach) establishing orientation of processes and considering specific conditions of localization of IE and DE;

3) forming of the mechanism of ensuring parity of IE&DE on the basis of laws and postulates of systematology, taking into account specifics of process of diffusion of structural elements and optimization of interrelations of IE and DE;

4) application of-level segmentation in the course of ensuring parity of IE&DE and definition of the priority directions at each level. The essence of ensuring parity of IE&DE is reflected in multidimensional process of morphogenesis of the economic system materialized in the form of mutual and cumulative conditionality of its subsystems;

5) development of practical recommendations and offers on ensuring parity of IE&DE in the context of definition of harmonious form of the managing influences providing steady trend of economic growth;

6) management decision making. The process of targeting the determinants of IE and DE is performed in order to achieve the desired parity of IE & DE;

7) the formation of a system of resulting indicators through the systematization of the results of the implementation of management decisions in the form of "appropriateness" of further ensuring parity IE & DE.

The given sequence of procedures for ensuring parity IE & DE in the control system is implemented considering:

1) laws of:

- self-development - each system acquires new properties of its functioning at the expense of its own resources of adaptation to the environment;

- transformation - each system, being in relationships and connections with the environment, is subject to the all-pervasive influence of the environment and influences the objects of the system, causing a change in the state of itself and the objects of the environment;

- integration - all relations in the system are summed up, forming their "system set", adjustable from a single control center;

- relativity - the properties and relations of the system absolutely correspond to real values only at a certain point in time;

- harmonization - each system, under the influence of the environment, strives for a comprehensive, adequate environment, balanced self-development in rational ratios of its strengths and weaknesses;

2) principles of:

- integration - the study of integrative properties and laws;

- openness of all systems "absorbing" systematology postulates – existence of opportunities of entering into them of any changes, performance of comparative analysis of processes of transformation, situations and phenomena;

- focus – existence of the purpose in process of implementation of the system analysis, certain prototype of structure of system which needs to be built;

- analyticity – orientation to identification and the analysis of content of system properties of object of management, opportunities of their use in real practice, ways of joint manifestation of properties in self-organizing system;

- resource self-sufficiency of system – determination of structure and search of sources of emergence of the resources necessary for ensuring its life activity, including self-government.

The physics of process of ensuring parity of IE&DE in control system can be displayed the principle of action of Clasp Locker fastener. Rationality and optimality of the process of ensuring IE & DE parity is determined by the ability of the relevant system to provide for the "coupling" and "uncoupling" of IE and DE in the process of ensuring the growth of production of material goods, reproduction of the production factors and improvement of the quality of life of the population at the maximum marginal productivity of the production factors and the marginal utility of goods produced using these production factors. Depending on the goal-setting and consistency of management decisions, the quality of the materialization of the constructive or destructive process is provided for.

The constructive process organizes optimum grip of IE and DE. The IE & DE parity - the form and content of economic and managerial relations, is formed. The destructive process is aimed at decomposition of the existing IE & DE in order to determine a new variant of the optimum possible connection of IE and DE in the changed conditions.

VI. CONCLUSION

To ensure parity of IE & DE in the control system, it is required to consider the cyclical nature of development of economic systems as a reflection of the system time law,

which determines the scalability of its own time. This cyclical nature must be sustainable. Stability is an integral property of complex systems. As it can be different in the essence and content, the requirement to divide into the structural (IE) and functional (DE) components arises.

Structural stability is the interdependence of multiple relationships, the forms of common objectification, based on the idea of physical and structural integrity of the system. Functional stability shows the ability of the system to maintain and/or restore the logical relationships in case of applying the destructive effects on its elements.

Mechanism providing parity of IE & DE in the control system should maintain the structural and functional stability in accordance with the laws and principles systematology and possess the required attributes and properties, inherent to the economic systems.

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