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INFORMATION ANALYSIS OF STRATEGY FORMATION OF RUSSIAN DIGITAL ECONOMY DEVELOPMENT UNDER INSTABILITY

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Abstract

An original approach to specifics of Russian digital economy development strategy formation under functional instability of the public administration system is described. The fundamental basis of the approach is author's methods of the virtualization theory. The state is a virtual functional organic system whose main function is to ensure vital activities of the population through utilization of available material and spiritual resources. This function is implemented by the public administration system which is a certain functional system that includes functional subsystems. An information model reflecting functions of the public administration system was developed. Critical states of the system were identified. The method for information modeling and analysis of the public administration system was suggested. Results of the study of the computer model of the public administration system were described. Based on these results, features of the digital economy development strategy under functional instability of the public administration system were determined. While ensuring controllable uncertainty of the system, any critical changes in functions of public administration bodies have no effect on the functions of the public administration system which remains controllable. The features of digital economy development strategy formation under the functional instability of the public administration system were identified: 1) mandatory involvement of public bodies (parties) as a fundamental basis for the development of the digital economy; 2) ensuring controllable uncertainty in the functions of public bodies. This confirms the expediency of the actions of the President of Russia aimed at protecting the digital economy against possible risks.

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Keywords: Digital economy, public administration, normalized entropy, threats to functional stability, virtualization theory, information analysis.



1. Introduction

A landmark event in the development of the Russian digital economy was the President message to the Federal Assembly on December 1, 2016. The President proposed to “launch a large-scale system program for the development of the digital economy relying on Russian companies, scientific, research and engineering centers”. “This economy will contribute to national security and technological independence of Russia”.

At present, the Program for the Development of the Digital Economy of Russia which defines main directions of the state policy has been developed in order to comply with national interests and implement national priorities. The leading role of the state in forming the digital economy determines the relevance of analysis of threats to the functional stability of the public administration system (Morelos-Zaragoza, 2006; Peterson & Weldon, 1976; Niederreiter, 1986). The approach for substantiating characteristics of the digital economy development strategy is based on author methods of the theory of virtualization (Kotenko, 2011; Kotenko & Polyakov, 2018; Shannon, 1963).

2. Problem Statement

The main management system capable of ensuring effective development of the digital economy is the system of government. Due to this fact, all the threats to the digital economy are aimed at undermining the public administration system. Hence, the analysis of functions of public administration systems and identification of critical models of these functions is a basis for determining productive goals of threats to the digital economy and effective approaches to fighting against these threats.

3. Research Questions

Virtual presentation of the functional scheme of the public administration system

Considering the state as a virtual functional organic system, it can be noted that the main function of this system is to ensure the livelihood of the population through utilization of available material and spiritual resources. Thus, the general structure of any state includes two basic functional parts: population and material and spiritual resources. These parts should be interconnected at the functional level. This relationship is provided by the functional communication system (management system), which includes two main links inherent in each state: bureaucratic and private ownership (Kotenko & Polyakov, 2018). People and material and spiritual resources interact through the bureaucratic and private ownership of the state. These links are formed from representatives of the population. At the same time, the principles of formation are different.

Thus, the state can be represented as a certain functional system including a certain set of functional systems. L. Boltzmann who revealed the physical meaning of entropy as a measure of disorder in functional systems, emphasized that the full order corresponds to the minimum entropy, and any disorder increases it (as cited in Kotenko, 2007). From his point of view, entropy can be considered as a characteristic of the effectiveness of the state management system (Kotenko, 2007).

As for the virtual representation of the functional scheme of the state, entropy of the public administration system can be represented as

$$h_G^0 = h_G/h_{\Gamma_{\max}}^0 = h_B^0(1 - h_C^0) + h_C^0(1 - h_B^0) + H_{BC}^0, \quad (1)$$

where h_G^0 is the normalized value of entropy of the public administration system; h_B^0 and h_C^0 are the normalized entropy values of the bureaucratic and privately owned managers, respectively; H_{bc} - the entropy of the interaction of bureaucratic and private ownership links:

$$H_{BC} = (2h[X_B]h[X_C] - I[X_B;X_C])/h_{\Gamma_{\max}}. \quad (2)$$

where $h[X_B] = h_B$ and $h[X_C] = h_C$ is entropy of the bureaucratic and private ownership links, respectively; $I[X_B;X_C]$ is the average mutual information of the bureaucratic and private ownership links.

The resulting expression allows us to determine the impact of bureaucratic and private-ownership links on the state management system.

Expressions (1) - (2) are a general mathematical model of the public administration system. Its specification requires identification of the principles of the influence of bureaucratic and private-ownership links by synthesizing their mathematical models.

4. Purpose of the Study

The aim of the study is to substantiate characteristics of the digital economy development strategy under functional instability of the public administration system.

5. Research Methods

Information models of critical states of the public administration system

The system of public administration is characterized by two critical states: “chaos” and “cold death”. The first one corresponds to the collapse, the second one – to the extinction. The same states are also characteristic of the main elements of the system of government.

Let us analyze the critical situation of “extinction” of the state apparatus and its influence on the bureaucratic level. The model is determined as

$$H_B = \lim_{h_{\Gamma_A}^0 \rightarrow 0} \left(h_{pa}^0(1 - h_d^0) + h_d^0(1 - h_{GA}^0) \right) = h_d^0. \quad (3)$$

Entropy of the bureaucratic link will be determined by entropy of the apparatus of democracy. Hence, the bureaucratic link as a functional system can be threatened by two states of the apparatus of democracy: the first one is characterized by a zero value of entropy h_d^0 , $H_b = 0$, (“cold death”); the second one is characterized by the entropy h_d^0 aiming at unity which can lead to equality $H_b = 1$ (“chaos”). In case of optimal controllable uncertainty of the apparatus of democracy ($h_d^0 = 0.5$), any changes in the entropy of the public apparatus will be uncritical for the bureaucratic link.

These conclusions can generate the idea of usefulness of the apparatus of democracy. However, in some cases, this activity may be a threat to its existence. Activities of the apparatus of democracy in states with a fairly conservative and old government apparatus whose entropy is small due to its inherent tendency to stagnation ($h_{ga}^0 \rightarrow 0$) are especially dangerous. The active role of the apparatus of democracy contributes

to conflicts of interests of its constituent elements which inevitably increases unpredictability of its actions.

For the apparatus of democracy, this trend is manifested in an increase in the value of its entropy ($h_d^0 \rightarrow 1$).

The model of this critical situation can be represented as

$$H_B = \lim_{h_{GA} \rightarrow 0} \lim_{h_{HB} \rightarrow 1} \left(h_{GA}^0 (1 - h_{HB}^0) + h_{HB}^0 (1 - h_{GA}^0) \right) = 1, \quad (4)$$

which corresponds to the collapse of the bureaucracy and the state as a whole. No less dangerous is excessive activation in the conditions when the state apparatus is in its infancy.

An excessive increase in the activity of the apparatus of democracy is quite natural. Feeling decrepitude or inexperience of the state apparatus, it wants to take advantage of the situation and extends its influence on the system of power as much as possible. This desire generates an ever-increasing activity of the apparatus of democracy. The increase in this activity is manifested in the increase in the activity of the elements of this apparatus, representing a wide range of diverse and often contradictory interests. The irreconcilable struggle of these interests causes a chain reaction of unpredictable decisions and actions on the part of the apparatus of democracy increasing its entropy ($h_d^0 \rightarrow 1$) and as a causing the “cold death” of the bureaucracy and the state as a whole. A historical example of this situation is the death of the Russian empire when the Tsar abdicated the throne, and the chaos in the State Duma did not allow it to retain power (Polikarpov, Kotenko, & Polikarpova, 2013; Polikarpov, Kotenko, Polikarpova, & Rumyantsev, 2016).

The in-depth analysis of the conditions for the entropy h_d^0 striving towards 1 allows for revealing an important regularity. Based on the social impact factor, the apparatus of democracy includes two main parts: 1) the system of public administration bodies (parliaments, etc.); 2) the system of public influence bodies (parties). Thus, the entropy h_d^0 can be represented as

$$h_d^0 \geq H_d = h_{ab}^0 (1 - h_{ib}^0) + h_{ib}^0 (1 - ab), \quad (5)$$

where h_{ab}^0 is the entropy of the system of public administration bodies; h_{ib}^0 is the entropy of the system of public influence bodies.

Thus, at the stage of state formation, when the “chaos” of the public administration system ($h_{ab}^0 \rightarrow 1$) is pronounced, the system of public influence bodies may take on decisive importance causing a critical situation

$$H_d = \lim_{h_{OY} \rightarrow 1} \left(h_{ib}^0 (1 - h_{ib}^0) + h_{ib}^0 (1 - h_{ib}^0) \right) = 1 - h_{ib}^0. \quad (6)$$

The tendency h_d^0 towards 1 can be neutralized by an increase in the activity of the system of public influence bodies (an increase h_{ib}^0). As can be seen from Fig. 01 and Fig. 02, when $h_{ib}^0 = 0,5$ any changes in the uncertainty of the functions of public administration bodies (h_{ab}^0) will not affect the efficiency of the functions of the apparatus of democracy.

6. Findings

Features of the state digital economy development strategy

Let us define the state of the system of public influence bodies, in which $h_{ib}^0 = 0,5$ as the state of optimally controllable uncertainty.

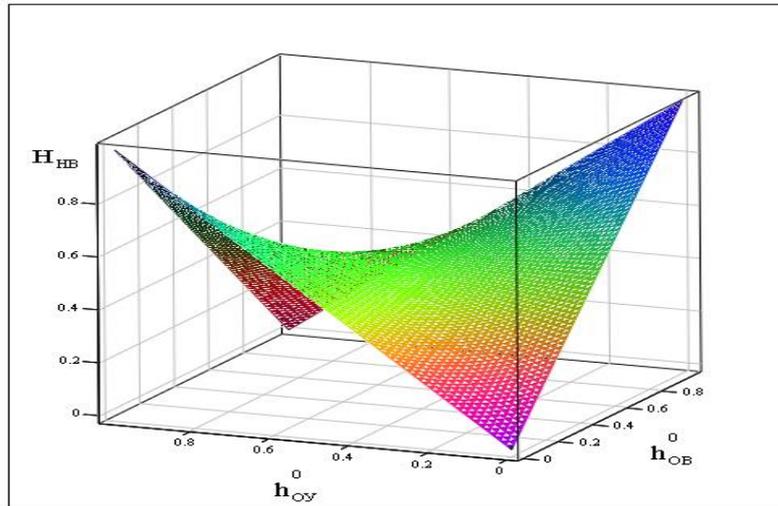


Figure 01. Dependence of the entropy of the apparatus of democracy on the entropy of the system of public administration bodies and the entropy of the system of public influence bodies

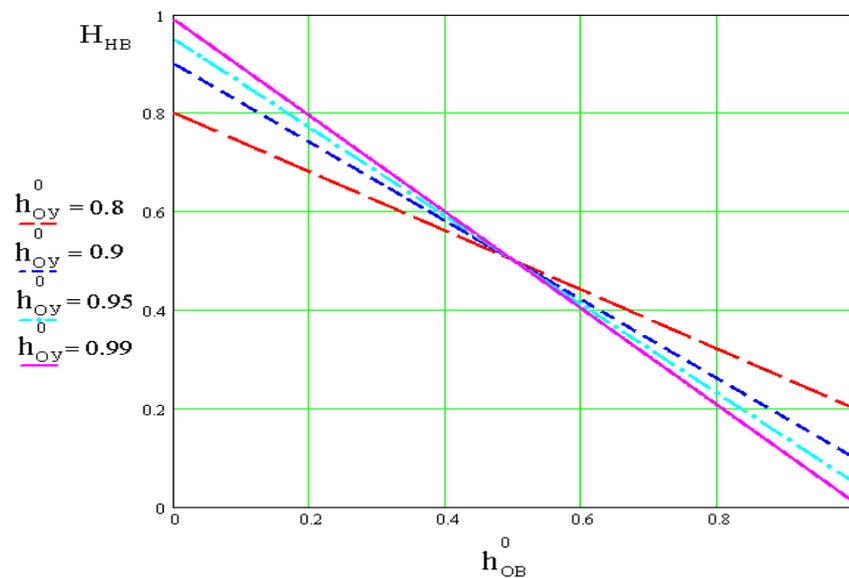


Figure 02. Dependence of H_d on h_{OB}^0 $h_{ab}^0 \rightarrow 1$

Having summarized the result obtained, we have

$$H_B = \lim_{h_{GA}^0 \rightarrow 1} \lim_{h_{OY}^0 \rightarrow 1} \left(h_{GA}^0 (1 - h_{HB}^0) + h_{HB}^0 (1 - h_{GA}^0) \right) = h_{OB}^0. \quad (8)$$

It can be seen that even in the limiting case ($h_{GA}^0 = 1$ and $h_{OY}^0 = 1$) which corresponds to the “chaos” in the state apparatus and in the system of public administration bodies (parliament, etc.), the entropy of

the bureaucratic link is determined by the system of public influence bodies. At the same time, in the state of optimal controllable uncertainty of the system of public influence bodies, any changes in the uncertainty of the state apparatus (h_{GA}^0) and public administration (h_{OY}^0) will hardly affect the public administration system (McEliece, 1978).

Under the controllable uncertainty of the system of public influence bodies, any changes in the uncertainty of the state apparatus and public administration bodies (parliaments) have no effect on the uncertainty of the system of public administration which remains optimally controllable.

7. Conclusion

In Russia, the first feature involves participation of the All-Russian Popular Front in the development of the digital economy. The second feature involves participation of the population in forming the digital economy while ensuring considerable discretion with optimal controlled coordination.

The following features are a basis for the digital economy development strategy:

1. The bodies of public influence should form a basis for the development of the digital economy.
2. In developing the digital economy, optimally controllable uncertainty of the public influence bodies should be ensured.

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