

Digital economic space: formation, laws, modeling

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Abstract — The article is devoted to the study of the new economic space, which received an impulse for development in the context of spreading new digital technologies. The objectivity of the digital economic space, which is expressed in the emergence, consolidation and development of elements of the traditional economic environment, was justified. The matrix of digital economy institutions, differentiating the zones of existence and activity of old and new institutions in the traditional and digital space was introduced. The patterns of formation and development of the digital economic space were determined: reproduction of the existing and functioning institutions of the real world in the digital space; the formation of new institutions that exist exclusively in the virtual space and have no equivalents in the system of industrial economy institutions; the formation of interconnected informational, behavioural and institutional cascades, etc. The scenarios for the development of the digital economic space, based on the nature of its state regulation, were proposed. The i-ligarch capitalism model implies the establishment of a state monopoly on the use of digital technologies. The “digital cell” model is based on total business control enabled by digitalisation. The digital NEP model is based on maximising the use of digitalisation opportunities by both government and business.

Keywords — *economic space, digitalisation, digital economy, Internet, institutional environment, patterns, development scenarios*

I. INTRODUCTION

Intensive process of global informational-communicative environment formation opened new horizons to socio-economic activity and led to formation of economic system of new type – digital economy. Its development is based on effective realisation of digital technologies and interaction mechanisms of economic agents. Integrating into economic relations system, they transformed economic processes with tremendous consequences for their development. Contemporary world agents are operating in two life areas: material, having been developed for thousand years, and, virtual, which is actively being formed now. New models of companies, businesses, markets and management are developing. All these introduce fundamental changes into usual conditions of firms and industries functioning.

Integrating into different socio-economic practices, total digitalisation process leads to creation of new economic space and, therefore, to fundamental shifts in the economy. So, there appeared the necessity in new approaches to examination of digital economic space and law of their creation.

The fundamentals of the research into economic space are laid in the classic works of F. Hayek, J. Schumpeter, as well as in works that reveal the theory of economic processes (W. Eucken, K. Polanyi, etc.), transaction costs (J. Commons, R. Coase) and institutionalism (T. Veblen, D. North and others).

Main ideas of informational-communicative society and economy are expressed in works of D. Bell, J. Galbright, M. Kastels, B. Latura, E. Masuda, F. Makhlop, E. Toffler, Ii. Shumpeter, J. Habermas and others. Works of E. Brousseau, S. McDowel, M. Muller, E. Parizer, F. Steinberg and others overview questions connected with Internet-economy and virtual relations. Despite great amount of research, there are enough unexamined issues of functioning of new economic structures, appearing in digital space.

The purpose of this article is to study the mechanism of formation and development of the digital economic space. The objectives of the study include identifying the characteristics of the digital economic space, highlighting its segments, identifying the patterns of its formation and defining models for further development.

II. MATERIALS AND METHODS (MODEL)

For fundamental research of digital economic space there was used contemporary methodological platform, integrating gnoseological potential of spatial concept, information-network approach and institutional concept, as well as analytical instrument of different science branches. Theoretical and methodological research base was also supplemented by theory of complexity, theory of autopoiesis, chaos theory, synergetics and the Internet concept, which was formed in the last decade.

III. RESULTS AND DISCUSSION

Reality of previous ages represented materialised socio-economic environment. In modern world, individuals and firms dive into the digital world, opening new horizons for development. Nowadays when quantity of users is increasing rapidly, the Internet has turned into a diverse system of new social relations, which stimulated economic, political, social, cultural and other transformations.

In the framework of economic research, the diversity of interpretations of the economic space should be noted. It is explained by the presence of various research aspects: system-structural, economic-legal and geopolitical.

Within the framework of the system-structural approach, emphasis is placed on the value of space as a container of economic activity, natural resources, communication systems, and national cultures [1]. Institutional approach implies the uniform rules for the implementation of economic activity throughout the country or region. The consideration of interstate and international cooperation factors is characteristic of the geopolitical approach to the study of the economic space. Economic space should be evaluated based on all listed approaches: each of them represents a productive field of research.

Modern economic space is being transformed under the influence of the information technology revolution, development and distribution of digital technologies. This creates an objective need for the formation of a new spatial paradigm that analytically describes a separate, stable, digital economic space with external integrity and internal diversity.

In the digital economic space rules and norms appear, strengthen and work; analogous to the traditional, as well as specific institutions are forming.

As it is known, any typical, regular and permanent action is “performed in institutional forms” [2]. This statement is also true in relation to actions, performed by the Internet agents. Therefore, institutionalism also characterises digital space.

In current conditions the Internet fulfils the functions, which are the same as of institutions:

- 1) regulation of individual’s behaviour, so that they do not harm each other, or compensation of possible losses;
- 2) minimisation of efforts, that people spend on finding each other and interacting with each other;
- 3) organisation of information transmission process or education.

Digital space is the result of cooperative activity of numerous agents. J. Bjukenen and G. Tallock are of opinion that all people are the only subjects, taking decisions about joined and individual activities [3].

At the same time, the formation of economic institutions in the digital space is subordinated by certain rules.

Let us turn to the matrix of modern economy institutes, which separates existence and functioning of old and new institutions in traditional and digital space (table 1).

TABLE I. MATRIX OF INSTITUTES OF MODERN ECONOMY

	<i>Traditional space</i>	<i>Digital space</i>
Old institutions	1	2
New institutions	3	4

Matrix shows, that digital space is represented by zones 2 and 4, where two types of economic institutions act: traditional, which appeared in industrial age, and new, operating in digital economy.

Zone 2 of the matrix shows situation, where basic economic institutions (property, exchange, competition, etc.) begin to coordinate interaction of digital economic space agents. This process does not require considerable costs, as far as economic institutions (norms and rules, organisations, results of agents’ interactions) already having been established during long period of time, are simply duplicated under absolutely new conditions – in forming digital segment of modern economy (table 3).

TABLE II. DIGITAL TRANSFORMATION OF ECONOMIC SPACE

<i>Real components</i>	<i>Digital components</i>
Transaction	Digital transaction
Contract (written / oral)	Virtual agreement
Market	E-market
Firm	Virtual firm
Traditional trade	E-commerce
Traditional employment	Distant form of employment
Financial system	Electronic financial system Virtual money
Government	Electronic government Electronic democracy
Ownership of material objects	Ownership of digital objects

Taking into consideration data about methods, character and scope of interaction of agents in digital space, we come to conclusion that it repeats all institutions and practices of ordinary world: institutions-rules and institutions-organisations (market, firm, state, household); formal (law performance) and informal institutions (ethics if interactions, traditions); legal (e-commerce) and shadow institutions (digital piracy); nano-level institutions; micro-level, mezzo-level, macro-level and mega-level institutions etc. Among the number of examples, confirming this conclusion, we can mention research of P. Steinberg and S. McDowel, who proved that the established in global politics coordinative net of governments is reproduced in the Internet domain system [4].

In zone 4 of the given matrix, new institutes, which do not have equivalents in the system of pre-digital economy institutions, arise and function. Currently we can discuss separate elements of forming digital institutional space. Blog-sphere, wiki-platforms, different Internet communities are among them. In previous systematisation following institutions, existing only in virtual space, are of interest. Among them: IP-addressing which became of the same importance as a new economic resource [5]; domain names, whose emergence at the

end of the 20th century required the creation of a system for their registration, attachment and regulation of the relevant market; property rights in the Internet and their protection. In the opinion of E. Brousseau, digital technologies stimulate creation of decentralised property rights system, different from traditional system, offered by the government [6].

Therefore, digital economic space is filled by: traditional institutions, reflected in the frames of virtual economic environment, and institutions, existing only in virtual space.

As a result of the above mentioned processes, rapid, strenuous institutional processes take place in virtual environment, indicating exponential increase in the number of institutional norms. Their high speed, in our opinion, is due to the following:

1) as far a sample (analogue) of majority of institutions (firm, market, state) has already been created in real world, their duplication, transference to virtual space is quick and in some cases immediate (transactions).

2) rapid increase in the number of agents, interacting in virtual space, so that every real world agent can be represented by some (the amount is unlimited) agents of virtual world.

3) cascade, strengthening mechanism of institutionalisation of virtual space (informational [7], behavioural and institutional) forming institutional cycle with positive feedback, increasing institutional space performance.

3) low transactional costs of interaction in virtual space

4) high data transfer speed via communicative networks.

5) limitlessness, absence of physical borders of virtual space.

Therefore, we introduce exponential law of digital economic space creation.

To determine the quantitative indicators characterising this space, G.B. Klejner's description of the density and saturation of economic systems can be used [8].

The saturation of space can be determined depending on digital technologies coverage rate of country's (region's) population.

The density of space should be understood as the average number of institutionalised norms adequate to the digital economy, which are mandatory or desirable to follow for the subjects of the economy. In this case, quantitative indicators can only be conditional.

The degree of the breadth and prevalence of the entire space S_{digital} or its some subsystem $S' \in S_{\text{digital}}$ to a given set of agents $A' \in A$ and, accordingly, the institutional saturation of this part of the socio-economic space can be judged by the potency (number of elements) of the set:

$$M = A' \setminus I_{\text{digital}} \in S D_{\text{digital}}$$

where A' is the set of agents of a given type, D_{digital} is the union of the carriers of all the norms included in the given institute $I_{\text{digital}} \in S'$.

From the formal point of view, the density of a digital economic space of S_{digital} can be characterised by the potency of an institutions set, whose carriers contain this element $a \in A$.

Some foreign ideologists perceive the state's ability to control the processes occurring in the digital space as illusory, what makes it possible to proclaim the independence of the new space from state regulation [9]. However, it would be wrong to call the Internet "a space without laws" that no one manages and which is uncontrollable by definition.

Governments of an increasing number of countries are beginning to seek control over digital space, both locally and globally.

A study of global trends in government regulation and self-regulation of the digital space has revealed [10]:

- increasing state influence on the Internet in most countries;

- subordination of state regulation of the Internet to the goals of national security, economic growth, citizens' rights protection, protection of children, combating cybercrime, developing e-commerce, protecting intellectual property and others.

In our opinion, the nature of state regulation of the digital economic space in the future will determine the level, quality and pace of development of firms, industries and the economy as a whole.

Today, Russia is implementing a set of measures aimed at accelerating the digitalisation of the economy, ensuring coordination of the actions of all government levels in this direction and promoting the introduction of digital business models. However, in the context of imposition of harsh anti-Russian international sanctions, falling oil prices, changes in the development trend of the Russian economy and the final formation of Russian state capitalism, it becomes clear that the forecast figures and plans embodied in the Electronic Russia program cannot be fully implemented.

In this case, there are three scenarios for the development of the digital economic space.

Scenario 1. i-ligarch state capitalism.

The scenario assumes a complication of external economic and political conditions: the growing global economic crisis, a reduction in the demand for energy resources, the preservation of sanctions, a drop in Russia's GDP, an increase in inflation, a depreciation of the ruble. The channelling of Russia's existing financial reserves to support state-owned companies and a number of large companies. A significant increase in the cost of digital technologies due to the growth of the ruble value of equipment. Intensive use of digitalisation capabilities for 100% collection of taxes and non-tax payments. Reduction in the use of digital technology by small and medium-sized businesses.

Scenario 2. "Digital cell".

The scenario assumes a moderately negative impact of the world economy on Russia (the preservation of sanctions), slow

economic growth. The intensive development and spread of digitalisation in Russia - a widespread use of digital technologies, both by the government and business. Digital technologies available for business are relatively inexpensive and diverse. Companies manage to take advantage of digitalisation opportunities - mainly it concerns the IT sector, trade and services. At the same time, the Russian state closely controls the business, using the capacities of digitalisation. State support is limited, but there is a very tight, close to "total" control of business using digitalisation capabilities. As a result, unwillingness and even refusal of development, even if opportunities exist.

Scenario 3. Digital NEP (new economic policy).

The scenario implies a significant improvement in relations between the state and business, weakening sanctions pressure, guarantee of stable "rules of the game", stabilisation of the tax burden. Active use of digital technologies, both by government and by business. Assistance in access to digital technologies for enterprises of various industries. The explosive growth of small and medium businesses based on the use of digital technologies in different areas - from trade to various services. Business focus on development - launch of new projects, expansion of existing business, operation in several industries. Improvement of business efficiency and competitiveness. State's use of digitalisation instruments not only for control, but also in order to reduce the firms' administrative costs. Provision of equal competitive positions [11].

IV. CONCLUSION

Thus, the modern economic space is being transformed under the influence of the development and spread of digital technologies. A digital economic space with external integrity and internal diversity is being formed. In the process of its formation, a number of regularities can be traced: the reproduction of the existing and functioning institutions of the real world in the digital space; the formation of new institutions that exist exclusively in the virtual space and have no equivalents in the system of industrial economy institutions; the formation of interconnected informational, behavioural and institutional cascades, etc. The nature of government regulation of the digital economic space in the future will determine the direction, level and pace of development for firms, industries and the economy as a whole. Possible scenarios for the development of the digital economic space are the models of i-ligantic capitalism, which implies a state monopoly on the use of digital technologies, a "digital cell" based on total digital control of business, and digital-NEP based on maximum use of digitalisation opportunities by both government and business.

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