

Evolutionary Approach to Infrastructure Formation in Russia's Economic Systems with Using Supply Chain Management Strategy for the Mineral Raw Material Specialization

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Abstract- The article presents the theoretical framework for the infrastructure formation in the economic systems specializing in mineral raw materials, by using supply chain strategy. It is determined by objective processes of economic development and sectoral peculiarities, in the form of synthesis of reproduction, structural-functional and systemic approaches in supply chain management. It allows developing adequate mechanisms aimed at maintaining and further developing infrastructure of territorial economic systems (TES).

Keywords - infrastructure, economic system, industrial raw material agglomeration, supply chain management, territorial economic systems.

1. Introduction

Reforming the socio-economic processes in Russia necessitates the involvement of unused opportunities and sources of development against the background of a slowdown in economic development rates and the contraction of international relations. Formation of self-developing economic systems within its regions is capable of ensuring the long-term sustainable territorial development through the use of the potential of industrial-raw material agglomerations and the activation of market mechanisms. Increase in the investment attractiveness of such structures through the creation of conditions for the realization of the development potential is largely associated with the expansion of the infrastructure component in accordance with the business needs and the strategy of the socio-economic development of territorial economic systems (TES) [1, 2, 3]. In the process of economic development, determined by the evolution of social economy models (from natural form to commodity and market ones), the infrastructure operation patterns were transformed towards complicating the infrastructure component of the economy. Starting

from the studies of the classics of economic thought [4,5], who were the first to denote the economic role of infrastructure in the social division of labor

; [6], who emphasized the need for infrastructure development as the “general conditions of the social process of production” necessary for the effective organization and development of productive forces; neoclassicists [7,8], who reflected faith in the unlimited possibilities of a self-regulating market economy by means of the full use of resources (and infrastructure ones, in particular), the importance of infrastructure in creating conditions for the existence and development of relevant types of economic activities and market institutions was expanding. As J.M. Keynes wrote about his teacher: “A. Marshal was the first to devote his life to the creation of economic science as an independent subject built on its own postulates and distinguished by the same high level of scientific precision as natural and biological sciences...” [9]. It was with the emergence of the neoclassical trend, which represented, on the one hand, the reaction to the classical school and Marxist studies, with their desire to analyze global dynamic processes and patterns of economic development, the formation of a systematic teaching on infrastructure took place, and in practice its establishment as a sphere of social production. The process of infrastructure formation in Russia reflected the nature of the development of productive forces and production relations at each stage of economic development as a relatively independent sphere of social production. This was reflected in the evolution of approaches to its formation (the reproduction, structural-functional, and systemic approaches and can be traced in the works of the scholars representing various scientific schools: the supporters of the Marxist theory who were the first “legal Marxists”

[10, 11, 12]; the representatives of the social democratic movement [13, 14, 15, 16]; the founders of economic and mathematical scholarly tradition [17, 18, 19], and later on the economists of the Soviet era [20, 21, 22,23, 24, 25], Russian reform economists [26, 27].

In modern conditions, dictated by the emergence of an innovative economy, a systemic view of infrastructure is being formed, which is emphasized in the publications of [28], [29], [30], [31], [32], [33,34] and others, caused by the following aspects:

- the reproductive nature of the infrastructure manifestation, which predetermines the need to identify the elements and establish relationships between them;
- the ambiguity of the allocation of TES infrastructure and the presentation of its structural and functional composition;
- the wide interpenetrating nature of the main functions, as well as a set of inherent specific properties.

Using the provisions of the systemic methodology in the process of forming the infrastructure of the territorial systems of Russia aims at understanding it as an integral economic system that satisfies all the systemic characteristics and forms close connections between the elements (business units): it interacts with the external environment, has its own structure and hierarchy of elements, each of which performs its specific function and participates in the implementation of the target orientation.

2. Problem Statement

The development of economic views on infrastructure in Russia was influenced by the world practice in close connection with the general movement of scientific thought, starting with individual studies in certain areas, primarily in commerce, and later in industry, and expanding to a systemic view. In the 17th century the economic views of [35], triggered off mercantilist ideas, expressed in the analysis of economic categories and patterns in the sphere of trade operations and circulation, in substantiating the nature and directions of the state's economic policy, and were aimed at increasing its monetary wealth and thereby strengthened the economy and increased the sustainability of the economic system [36].

The progressive nature and economic determinism of the events happening in the country contributed to the emergence of classical economic theory; in

Russia this theory was supported by [37]. Emphasizing the regulatory role of the state in the development of domestic industry, Russian scholars linked Russia's economic future with the formation of commerce, the transformation of the financial system and monetary circulation. For example, to stabilize the monetary system in the country at the suggestion of the issue of paper money was suspended and a silver ruble was introduced. "formulated the idea that the young industries, trade, financial business of developing economies need customs protection, because the processing industries induce learning processes that are crucial for the economic development of the nation". At the same time, in contrast to Western economists, Russian scholars referred to the activities of scientists, artists and handworkers, whose ability to scientific work, learning and education [38] called the "best capital", and A.K. [39] brought it to the level of practical developments and embodied them in the developed theory of civilization (theory of services), which received worldwide recognition [40]. Despite the progressive nature of Russian economic thought, the first attempts to restructure government administration and public relations could not be implemented for objective reasons: preserving feudal-serf relations against the background of a complicated international situation. Only in the late 1840s under the influence of the radical views of some Westernizers and, above all, of [41] and [42], a new ideology of a revolutionary democratic nature was put forward in the country, making it possible for Russia to bypass the capitalist stage by means of the peasant revolution and move to a new stage by mastering the relevant elements of development (based on community, collective ownership of the means of production and infrastructure facilities, in particular), relying on the assistance of industrialized countries. Such a progressive ideology had a significant impact on the entire development of advanced social thought, which stood in the way of subsequent socio-economic transformations in the country. By this time, in Russia, the outstripping development of productive forces on the basis of improved means of production and technological processes and the associated continuous increase in labor productivity had an impact on the development of production and social infrastructure facilities, developed transport and communication systems that improved the organization of production and exchanges of goods [43]. Belief in the historical

mission of Russia in combination with the assimilated and revised ideas of Western European socialist thought served as the basis for the populistic doctrine of the Russian variety of peasant socialism, formed from the diverse intelligentsia of the late 19th century. On the one hand, the revolutionary movement advocated the introduction of the rule of law in the country with the development of industrial production and infrastructure facilities. On the other hand, representatives of the moderate stand put forward depoliticized “going to the people” programs, during which socio-cultural infrastructure (education, health, culture facilities) developed through the development of educational activities in municipalities. Despite the liberal approach of a moderate direction, it made a more significant contribution to the development of economic doctrine, denoting the central position of the “critical thinking personality” in the progress of society [36]. A theoretical and ideological trend, the so-called “legal Marxism” appeared was a unique expression of the liberal bourgeois thought in Russia of the late 19th century – early 20th century, whose representatives [10,12,11], substantiated the objectivity and regularity of the development of capitalist mode of production and related technical, economic and spiritual culture in Russia. Proving the inevitability of Russia’s transition to the capitalist path of development, [10] underlined that “the growth of large-scale industry and transport (infrastructure facilities) creates conditions for engaging backward corners and localities of Russia in the economic turnover, for the emergence of prerequisites for rational management in agriculture.” “All modern spiritual and material culture was closely connected with capitalism,” wrote the young economist [10] in his first book, published legally in 1894 ... this culture “grew up with it and on its soil”, he continued. While capitalist relations were developing, liberal ideas gradually faded into the background, giving way to the social democratic movement among the radical intelligentsia [13, 14, 15,16] who, remaining on socialist positions, conducted the theoretical search rather on the way of recognizing the progressiveness of the capitalist development in Russia than in the direction of using the country’s peculiarities. As a result of another economic experiment, named by [16] as the “Red Guard Attack on the Capital”, not only individual enterprises, but entire sectors (mainly in heavy industry) and infrastructures (railway and water

transport enterprises, trade companies and banking institutions) were nationalized. “Nationalization should not break the capitalist economic relations, but on the contrary, unite them on a national scale, become a form of capital functioning under the control of workers involved in state ownership”, wrote [16] later. In practice, it turned out differently: deepening the process of capitalism, in its state-monopolistic form did not eliminate the root features and its contradictions, it led to the complication and aggravation of relations, instead, “confusing” the opposite beginnings of monopoly and competition and, thereby moving a social explosion closer. The Civil War, which began in 1918, was the result of the national crisis that arose since the revolution of 1905-1907, aggravated during the First World War and led to a general social armed confrontation that swept the whole country in the early 20th century. The unrestrained artificial centralization and militarization of power, production, distribution and supply became the basis of the military-communist model, as a result of which by 1920 the national income of the country decreased from 11 to 4 billion rubles compared with 1913. The performance indicators of various branches of industry decreased by a factor of 5–30 compared with the prewar ones; infrastructure facilities were morally and physically obsolete and were not updated throughout the entire period of the First World War and the Civil War (Federal State Statistics Service, n.d.). To restore the economy destroyed by the Civil War, intervention and the “war communism” measures the Soviet government decided to temporarily deviate from its principles with the introduction of market relations into the economy. The concept of a mixed planning-market model of the economy was formed under the influence of the studies of the Russian national school economists who assumed that the use of commodities monetary relations was determined by the need to ensure the material component of the forming state. Later based on the ideas of the first economists and mathematicians: [17], and others, who were on the verge of economic-mathematical synthesis, simulating various processes in the economy, [20] for the first time gave a mathematical formulation of production problems of optimal planning and proposed effective methods for their solution and techniques of economic analysis of these problems. Thus, in the works of progressive scholars and government officials of the time, differently assessing what was happening in the country,

attempts were made to understand the country's economic system relative to the emerging market conditions [44,45]. As a result of the progressive development, in 1927/28 the national economy of the USSR reached the level of Russia's industrial production in 1913. However, neither the concessions, nor the mixed enterprises received their development, because they faced a rigid state mechanism in the form of its central government bodies, which if did not hinder the economic freedom of entrepreneurs, but limited it. The main objective of the planned economy introduced by the end of the 1920s in the USSR was to increase the economic and military potential at the highest possible rates. Expressing the views of the management of planning bodies, the chairman of the State Planning Committee, a supporter of the teleological approach to the economy transformation [21] considered that industrialization would lead the country to the level preceding the unfolded phase of socialism through a phased formation (from the development of the extractive industries, agriculture, transport reconstruction and construction of energy facilities). The first five-year plans resulted in the development of industries and infrastructure, owing to which GDP growth amounted to 4.6% per year during 1928-1940. The rapid growth of production capacities and output, commissioning of about 9 thousand large industrial enterprises and industrial infrastructure facilities, such as transport enterprises, energy generating facilities (The Dnieper Hydroelectric Station and others which allowed to increase electricity production from 5 billion kWh to 48 billion kWh) had a huge importance for ensuring economic independence from capitalist countries and strengthening the country's defense (Federal State Statistics Service, n.d.). The restoration of the Russian economy after the war took place in an atmosphere of general emotional growth, while maintaining the same methods of managing the general proportions of the economy, but with the provision of certain independence to enterprises. In the shortest possible time by the end of 1948, at the cost of incredible efforts, the USSR managed to restore and even exceed the prewar level of industrial production by 73%, in which defense and heavy industry prevailed. More than 6.2 thousand industrial enterprises of mining, manufacturing and processing industries and infrastructure facilities in energy and transport (rail, water, pipeline and automobile) were commissioned; these innovations

increased national income by 64% of the pre-war level (Federal State Statistics Service, n.d.). It became possible to achieve similar results owing to an effective system of organizing scientific activity (where more than 6 billion rubles were allocated from the state budget), which enabled to implement and introduce experimental and theoretical works of Soviet scholars in the restoration and development of the economy. Despite the impressive results of the first post-war five-year plans, the economic situation of the country by the mid-1960s was characterized with a slowdown in productivity improvement and, as a consequence, in the total national income, caused by a decrease in the potential for growth and marginal returns in a number of sectors of the national economy. In the early 1960s a number of economists headed by E.G. Lieberman [22, 21], experts of the USSR State Planning Committee, many chief executives who initiated a discussion on strengthening the role of commodity-money instruments in managing the socialist economy emphasized the importance of giving the economy of the USSR progressive advancement. Finally, by the autumn of 1967, 5.5 thousand enterprises (1/3 of industrial output, 45% of profit) and 32 thousand enterprises (77% of industrial output) by April 1969 worked under the new system – large infrastructure projects were implemented (the creation of the Unified Energy System, the introduction of automated management systems in the enterprises) that made it possible to show obvious results in the first stages of the reform: GDP grew by an average of 13%, labor productivity – by 7.4% (Federal State Statistics Service, n.d. The inconsistency and halfway policy of economic principles with a rigidly centralized planned economy, as well as international events in a number of countries of the socialist camp, led to the reform curtailment. This was facilitated, on the one hand, by the final victory of conservative, technocratic tendencies on behalf of the party apparatus and its leaders; and on the other hand, inconsistency and disagreement in the scientific community. Thus, whereas and other scholars emphasized the thesis about the incompatibility of the law of value and commodity-money relations with the socialist economy of the USSR in their works, and others, adhering to a different concept, argued the need to use the classical market mechanism as a full-fledged regulator of the socialist economic system. In addition, in the early 1970s the directions of the long-term development of the USSR national economy were studies by

research teams of scholars under the leadership of who were looking for a way out of the existing contradictions of production intensification and developed the options for the coordinated and proportional development of all links in the science-production cycle. Thereby, the absence of a unified approach to the introduction of elements of commodity-money relations under socialism was largely determined by the impossibility for economic theorists to explain the real nature of the economic system created in the late 1920s and formed by the end of the 1980s in the form of “state socialism”. Until the end of the 1980s the economy of the USSR continued to maintain its archaic, burdensome and highly monopolized structure, and management methods inherited from the industrial stage. In scientific terms, since the mid-1960s economists and mathematicians [20, 24, 23] made an attempt to apply progressive research methods (in particular, the theory of value) to solving applied problems facing the national economy. And, as a result, the work of Academician [23] basically marked a new stage in the development of economic management: from applied research to understanding the system of socio-economic relations, including modeling, projects of multi-level optimization of the national economy”. By this time, negative trends intensified further in the country’s economy, leading to an aggravation of the general economic situation: over 15 years (from the 1970s to the mid-1980s), the growth rates of national income and industrial production fell by 2.5 times, agricultural production reduced by 3.5 times, real incomes of the population decreased by 3 times. Proceeding from the existing situation, in the mid-1980s the country’s leadership attempted to accelerate the country’s economic development using elements of the free market. The transformation of the real sector to the conditions of a market economy in Russia did not yield quick results, as it was originally supposed when introducing the radical liberal direction of the reforms, as the introduction of standard monetarist measures intended for countries with an already established market system was of little use for an unbalanced Russian economy. Only since 2000, the situation began to stabilize: by 2008, Russia’s GDP in current prices had grown more than by 6 times – from 196 billion dollars in 1999 to 1,290 billion dollars in 2007; and by 2016, Russia ranked 6th in the world in terms of GDP (USD 3,397 billion), according to the World Bank (Federal State Statistics Service, n.d.). By this time, the state

determined that the Russian economy would be based on the economy of the regions and, above all, the mineral and raw material specialization, which was entrusted with the mission of financial and economic support for the country’s initial transition to an innovative development path, the successful implementation of which depended on the sustainable development and increase in social and environmental parameters of sectoral production. The peculiarities of such regions, conditioned by the availability of strategic raw materials, monopolization of markets, requirements of special reliability of production and social infrastructure systems in difficult climatic conditions and accumulated social problems, predetermine a special degree of state support and entrepreneurial responsibility in implementing investment projects in these territories.

The increase in the investment attractiveness of the latter was largely associated with the possibility of combining existing enterprises into economic structures with a unified production-social and financial infrastructure and appropriate coordination of the interests of enterprises. A significant contribution to the establishment and development of the investment mechanism, in the development of infrastructure facilities in Russia at this stage, both in legislative and in practical terms, was made [31], [32], [33,34], whose research results laid the foundations of the revival of lost private business forms and methods of managing when using and operating such objects.

3. Research methodology

The process of the economic development, caused by the Social Economy models evolution, led to the infrastructure functioning schemes transformation in terms of the economy infrastructure complication, and also in terms of the extension of its role in the formation of the existence and development conditions for the correspondent economic activities and market institutions. Starting with the classic authors [4,5], who were defending the interests of the “forming new type of consciousness, for which the being was open to all sorts of changes, transformations and collisions”, the scientists were trying to present the theory of socio-economic structure. The authors systematized the entire aggregate of the accumulated economic knowledge, laid the foundations of the labor theory of value, elevating the role of the productive labor as the value creator and showing the importance of social division of labor as a condition for increasing

its productivity. [4], defining productive labor, indicated that labor is realized in a particular object (product), and “services” disappear at the moment when they are presented. In addition the infrastructure was specified as an important social component of the economic system in the process of the economic division of labor. At the same time [4], and later [5] determined the productive labor aspect with the material production sphere, believing that the national wealth depends only on the proportion of the population, involved into the productive labor process and on its effectiveness rate (productivity). As a result they considered the infrastructure narrowly, paying attention only on the production component, disregarding the social function. Although the classical school representatives and the adherents did not manage to follow the monistic approach. It was replaced by the pluralistic concept of the production factors that was clearly presented in the 18 century [4]. The new “ideology” of the evolution actively penetrated into the material production and non-production sphere, and contributed to the formation of the set of concepts, theories of progress and technocratic approaches of the development, to some extent connected with the doctrines of [6]. The essence of his famous formation theory was formed by the class approach to society and separate stages of socio-economic development – formations definition, the change of which is objectively determined by the dialectic development of the productive forces and production relations. The advanced development of the productive forces on the basis of the improved means of production, technological processes and the permanent labor productivity increase connected to it, objectively required an appropriate infrastructure (namely: the developed transport and communication systems, which improve the production and goods exchange organization), “the common conditions of the social production process” necessary for the effective organization and development of the productive forces. Discovering the economic essence of the capitalist society development in terms of the aggravating contradictions within the framework of the productive forces and production relations unity as a result of the society transition from one formation to another, Marx revealed the existence and change of “the common conditions”. That was the social division of labor that provided “the social production division into the independent types of employment connected with each other by the regional exchange” [6]. Further intensification of

the contradiction (more significant growth of productive forces than production relations) led to changes in production relations, contributing to the progressive productive forces development, and hence to the intensifying of the general division of labor in the system of social reproduction. In the opinion of K. Marx, it contributed to the peculiar specialization of the industrial capital in the form of the isolation of its forms (commodity and money). In addition such a division of labor in the context of the industrial capital led to the forms of income isolation, and therefore to the separation of the capital-property from the capital-function, introducing the fourth level, that is the entrepreneurial ability, within the three-tier model of factors of production (land, labor, capital). The activation of the latter contributed to the introduction of new types of activity not only in the sphere of the material production (of an experimental nature, aimed at the development of the nuclear energy, electronics, automation, chemical industry), but also in the sphere of the circulation. The latter, from Marks’s viewpoint, required the appropriate “common conditions of the production, namely the channels and roads, facilitate the circulation or even make it generally possible for the first time” [6], to provide the interaction between the different stages of the manufactured products, their production and consumption. At the turn of two centuries a new neoclassical economic approach appeared, it was based on the reaction to the economic theory of Karl Marx and its critical understanding. Being a result of the synthesis of the labor theory of value and the marginal theory developed by the representatives of the classical political economy, the neoclassical theory declared a strong belief in the unlimited possibilities of a self-regulated market economy. The infrastructure was assigned the following role: the market system should provide the complete use of the resources in the economy (including infrastructure), and some imbalances that appear should be resolved on the basis of the market self-regulation. A. Marshal, the founder of the dualistic concept of price, studied the mechanism of the market economy functioning in his six-book “Principles of Economics” and regarded the concept of the “external economy” as a result of gratuitous appropriation of the beneficial effect of the infrastructure. According to, the market price is the result of the interaction of demand, which is determined by the marginal utility of the product, and supply, which depends

on the production costs. Thus, the formation of the non-classical approach represented, on the one hand, a reaction to the classical school (including Marxism) with its aim to analyze the global dynamic processes and patterns of economic development, to the of the spheres and mechanisms of the economic development explanation and the infrastructure proper understanding in the reproduction process. On the other hand, it presented the intentions of the economists to formulate the laws of the management optimal mode for definite enterprises in terms of the free competition and to determine the economic equilibrium principles of the system, and therefore, to make the economics an exact science, independent from the uncertain judgments that characterized the political economy since [4], and socially neutral unlike Marxism.

The intensive market relations development caused the inevitable institutional changes and contributed to the new market institutions foundation, as well as the effective ownership formation, that actively influence the economic development. As a challenge to the changes at the turn of the twentieth and twenty-first centuries, a new theory was formed with the goal to discover the institutional environment of the economic agents, as well as the interdependence of the institutional changes and the economic growth in the period of the market relations formation. The basic definition of the presented concept is the institution that is a set of formal and informal rules created by people, acting as a restriction for the economic agents, as well as the corresponding mechanisms of their adherence and protection.

The enforcement mechanism is a methodological necessity that demonstrates a certain shift from the classical concept of the “invisible hand” towards state or self-organized contracts networks as the public (state) regulator. Every exchange (transaction) from the neoinstitutionalists’ point of view implies “the complex of competencies” transfer by means of a contract that fixes the competencies and conditions for the transferring. That means the following:

- Modeling of the restrictions applied in the exchange rules and contracts, while mostly the idealized scheme of property rights is used in the neoclassical model as a pattern;
- The acceptance of the information and non-zero exchange expenses incompleteness, that contributes

to the study of the consequences of the positive transaction expenses;

- The acceptance of other dimensions (except price and quantity) of the measurable benefits, that contributes to the increase of the qualitative variations of production and the provision of services for economic results and economic organization.

The analysis of the market-type infrastructure formation based on the methodological approaches of the classical economic school, Marxism, the neoclassical approach and the synthesis of the neo-institutional theories, reveals the following features of the relationship between the state and business structures (investing companies) in the socially significant projects implementation ;

- The partnerships between the government structures and business entities in terms of which the large private investments can provide a steady vector of the permanent growth of the economic system;

The state formation of the partnerships basis. That means the following: the common internal and external economic policy; the legal support of the new relationship; the range and the legal status of economic relations subjects formation; the development of the effective means of control and relationships protection;

The minimization of the government interference into the economic processes of the business structures in terms of the infrastructure projects implementation, state focus only on the minimal material resources, objectively necessary for the normal functioning, that contributes to the natural combination of the administrative, legal, financial and other “liberal” means of state influence on the economic relations.

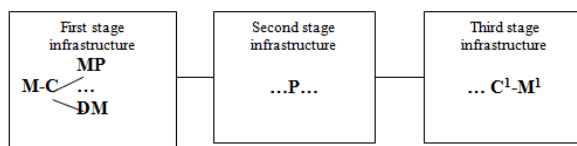
4. Results

The process of the infrastructure formation as a relatively independent sphere of social production, presenting the characteristic features of the productive forces and production relations at each stage of the economic development, determined by the specified form of the social division of labor, was revealed in the evolution of the development approaches (production, structural-functional and systemic approaches).

The basis of the evolutionary approach to the infrastructure formation is presented by the process

of the infrastructure reproduction as the permanent process of the common conditions development in the framework of the territorial economic systems (TES) as well as the definite conditions and factors of reproduction of each type of the infrastructure itself.

As a result of the evolutionary approach based on the doctrine of the dual nature of the social reproduction, the ambiguity of the infrastructure development has been formed. On the one hand, reproduction is a permanently repeated and persistent process of production and sale of the material goods and services, performing a capital cycle pattern that requires the infrastructure implementation at all stages of the reproduction process (Fig. 1).



Legend: M – money prepaid by the investor; C – commodities (introduced means of production, labor and other elements of production); P – production; C¹ – finished products; M¹ – money received by the investor from the sale of finished products and including profit.

Figure1. The infrastructure formation in terms of the reproduction approach (first approach).

The successive change of the functional forms in the model of capital circulation (from the monetary and productive to the commodity one) is associated with a peculiar cyclic self-increasing character of the infrastructure forms movement (from financial, to production, social, ecological and other types, and again to the financial form of the new cycle). At the same time, the industrial capital in the reproduction process does not only alternately changes the functional forms, but can also exist simultaneously in all three of them, that causes its own circuit of each infrastructure component. This can be presented in the following way (Figure 2):

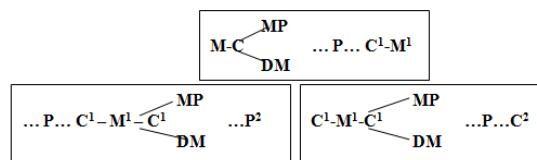


Figure2. The infrastructure formation in the context of the reproduction approach (the first approach, advanced).

Another approach is based on the fact that the reproduction is the process of the production relations development. Thus, the infrastructure

character will depend on the total social product movement through the phases of the reproduction process (production, distribution, exchange, consumption) (Figure 3).

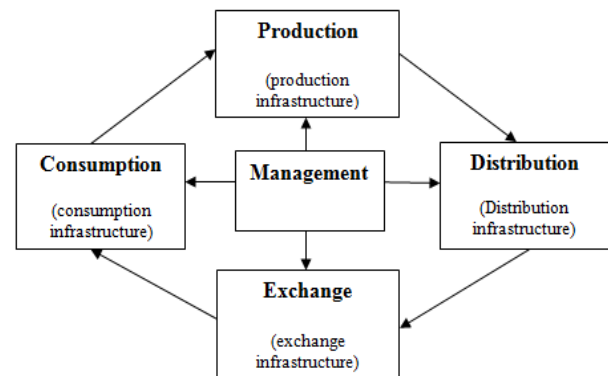


Figure3. The infrastructure formation in the context of the reproduction approach (the second approach).

According to scheme 1, the infrastructure forms movement is cyclical, starting with the production infrastructure (enterprises providing the technological production facilities, scientific and research, design and experimental institutions, etc.) with which the new cycle begins (method of production will be the defining one for the further phases). Developing into a distribution infrastructure that performs functions related to the division of a product (including budgets of all levels, tax services, treasuries, the board of directors of the enterprises, etc.), the infrastructure flow moves to the exchange stage, that provides the conditions and implementation for products transfer between the economic agents (infrastructure of definite markets, warehousing, systems of communication, financial, insurance, regulatory support, antimonopoly committee, etc.). The consumption infrastructure is designed to meet the needs of the population and provide the information on the quality of the products and the consumer satisfaction with goods and services of the enterprises. At this moment the consumption phase completes the production stage and at the same time marks the appearance of another reproduction cycle. The reproduction approach to the infrastructure development management predetermines the necessity to form the interconnections and interdependence between the infrastructure components, providing the effective development of TES and increasing the welfare of the population, which is possible within the framework of the structural-functional approach. The essence of the structural-functional approach is based on the priority of the system development of

TES, structure formation and the functional connection of the components studying. The study of TES infrastructure in the context of this approach is expressed in functions developing (the basic: providing, integrating, regulating, stimulating and communicating; and additional functions, caused by the area development significance, duration of the influence on TES development, interconnection with the settlement types). Their complex would allow regarding this economic activity type as a certain kind of infrastructure. The above mentioned basic and additional functions that characterize the specified aspect (in terms of the infrastructure functioning and development; its stimulation, regulation or communication), at the same time have the interconnected character (that refers to the providing, integrating and regulating functions). The interpenetrating character of the given functions provides the process permanence within the framework of TES, forming the links between business structures in a dynamic market environment through the integration of multi-level and multi-component TES infrastructure. The last is formed on the basis of the sectoral approach, focusing on the reproduction components of the infrastructure system. Namely:

- The basic industries, forming the production complexes;
- The social economic sphere objects, that have the state target functions;
- Institutional units, providing the branch production development;
- Other structures, united in groups according to definite characteristics (type of activity, legal organizational form and form of the ownership).

The result of the structural-functional approach is the formation of the infrastructure hierarchy, within which the infrastructure and industrial agglomerations sub-systems, interact with TES infrastructure components, creating the infrastructure (Figure. 4.) The analysis of the Scheme 4 data shows that alongside with the infrastructure sub-systems formation (movement from the base to the top), the functions are presented. At each level of the hierarchy presented, there is a definition of the dominant functions, the implementation of which is devoted to the sub-system formation. Thus, the regulatory function is presented at two upper levels, the communicative function is presented at the lower levels, and the providing function, being universal, is presented at each level. Thus, the presented infrastructure

hierarchy, which shows the infrastructure levels formation, presents the infrastructure links interdependence between the levels within both industrial agglomerations and TES in general.

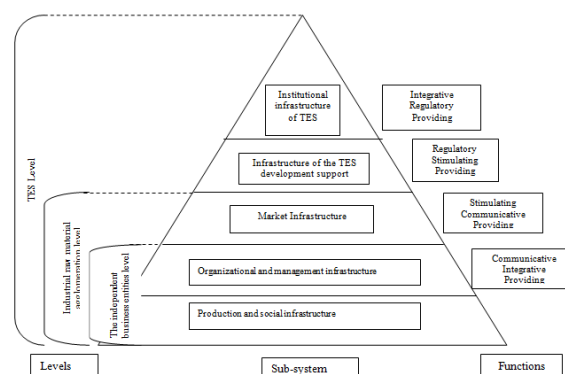


Figure4. Levels and functions of the infrastructure formation within TES.

Thus, the obtained results define the infrastructure formation in the context of the structural-functional approach as the process of creating a complicated multi-purpose infrastructure complex that includes components both external and internal to TES, which provide the business units operation in the markets of various products (works and services) in different sectors of the economy. The industrial agglomeration and TES combine the market and non-market infrastructure systems, contributing to the definite business units of TES functioning efficiency increase through the implementation of the infrastructure support of activities by means of the infrastructure systems formation and the use of the appropriate tools. In modern conditions of the innovative economy formation, a new approach of the infrastructure development appeared, which supplements and to a certain extent synthesizes the traditional approaches, such as the reproduction, structural-functional, etc., based on the system methodology. Analyzing TES infrastructure, we regard it as an integrated economic system that satisfies all system features and forms close connections between the components. Thus, it interacts with the external environment, has its own structure and hierarchy of the components, each of which performs its specific function and also participates in the target functions implementation. Alongside with the system characteristics, the system has some peculiar features, which are contributed by its sub-systems cooperation (utility, indistinct borders, compatibility, etc.). They characterize either the definite system type (for instance, the connection with the environment is typical only for the open systems), or act as the

description properties of the systems themselves (for instance, structural properties as the ability to describe a system by means of its structure defining, as well as the multiplicity or complexity of the description). Regarding TES infrastructure as an integral economic system, being the result of the evolutionary economic development of the infrastructure, and taking into account the specifics of the industrial agglomerations and TES formation in general, it is necessary to point out the following:

- Since the infrastructure of the industrial agglomerations acts as a derivative of the infrastructure of the second order (TES infrastructure in the hierarchy system after the national infrastructure), it is necessary to consider the infrastructure of the industrial raw materials agglomerations formation in the framework of TES and market system, defining its composition, functions, communications and infrastructure tools;
- TES infrastructure being a part of the economic system is defined as the basis for the business type process of reproduction, aimed at the innovative form of production organization, including a set of technical, technological, organizational, economic and social interconnections of the components that provide the sustainable development of TES;
- The infrastructure of industrial agglomerations and TES is generally regarded as a derivative of the market infrastructure, including a set of general conditions providing the market interaction of business units both within the system and with the external economic agents on a market basis.

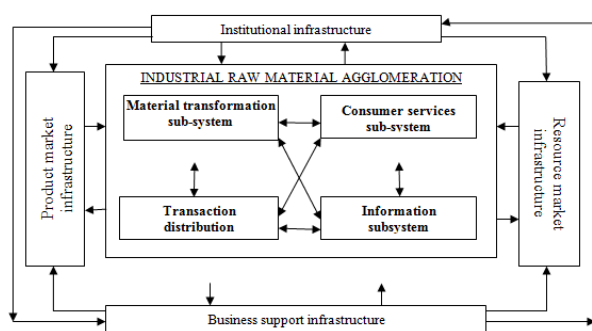


Figure 5. The industrial agglomerations infrastructure formation in the framework of TES development

Thus, the infrastructure of industrial agglomerations can be regarded as an integral system with a second-order infrastructure features (TES infrastructure), retaining the essential features of the first-order systems (infrastructure of the national economy) and acquiring the peculiarities

of the infrastructure provision object, such as the economic systems of the mineral-raw material specialization. The industrial agglomerations infrastructure formation in the framework of TES development (with the basic components of the infrastructure such as the “core” and additional objects, auxiliary and service facilities) is presented in Figure 5. The transition of the industrial agglomerations to the innovative type is possible on the basis of the innovative activity of the enterprises diversification and increase (first of all, raw mineral orientation, forming the core of the agglomeration), which have been developed on the basis of the territorial economic systems. In addition to the sectoral component that provides TES functioning presented in Scheme 5 as a material transformation sub-system, which combines the enterprises of the “core” (enterprises within the industries that form TES specialization) with the additional objects, whose activities directly support the “core” objects functioning, close innovation-oriented interactions between the sub-systems in the framework of TES development are necessary for the formation of the integrated innovative structures. Thus, the formation of new agglomerations within TES is an integration process, including the important characteristic of the current business structures in terms of their participation in the industrial agglomerations formation and the use of TES innovative potential. It takes place with the participation of various sub-systems. Namely:

- Transaction distribution subsystem that provides financial, insurance, marketing and other types of support in the services distribution sphere, including the implementation of the current transactions with real assets and transactions with real values;
- Consumer services sub-systems, including the activities in the sphere of social and personal services;
- Information subsystem, providing production, storage, processing and transmission of the information in order to increase the business structures information activity;

The transition to the innovative industrial agglomerations should be accompanied by the economic relations development both within the agglomerations and out of them, within the framework of TES development, using the institutional environment potential as well as the information, financial and legal systems of the entrepreneurship support.

5. Conclusion

The study of the process of infrastructure formation of Russian economic systems having mineral-raw material specialization in the context of changing the vector of economic growth towards the use of innovative systemic tools in the neo-institutional economy leads to the following conclusions by using supply chain management:

- in the process of economic development, determined by the evolution of social economy models, the infrastructure operation patterns were transformed towards complicating the infrastructure component of the economy, and hence expanding its importance in ensuring the creation of conditions for the existence and development of relevant economic activities and market institutions;

- from the standpoint of the reproduction approach, the TES infrastructure is a combination of various institutions, establishments and other business structures that provide common conditions for reproduction by activating the institutional environment, introducing appropriate tools to support the TES development, mastering new types of economic activity in accordance with the needs of the innovation economy, ensuring effective the development of territorial economic systems and the growth of the population welfare;

- from the standpoint of a structurally functional approach, the TES infrastructure is an organizational and economic system, the elements of which are combined by vertical and horizontal functional circuits, and are designed to promote improving the economic sustainability of territorial economic systems;

- from the standpoint of a systemic approach, the TES infrastructure is a holistic economic system that ensures the market interaction of business units both within the system and with economic agents which are external to this system on a market basis.

- in the conditions of changing the role of the state in managing socio-economic processes, including the infrastructure development, the search for organizational and legal forms, being alternative to direct state management of public property and based on the introduction of a public-private partnership mechanism within the boundaries TES development, becomes increasingly important;

- in Russia, the country with a high level of government alization of the economy in the context of an acute shortage of investment resources, the

innovation infrastructure should be formed within the framework of designing the investment strategy for the territory development targeted at implementation of priority investment programs (projects) and providing for the development of cooperation between the government agencies of all levels, business community and non-governmental organizations.

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