

# Transformation of Economic Processes under the Influence of Technological Changes



Lyudmila Borsch, Svetlana Yanova, Diana Burkaltseva, Elena Vorobyova, Nataliya Apatova, Amina Zharova, Svetlana Gerasimova, Maxim Soldatov

**Abstract:** *In the article, the authors have reviewed distinctive features of the development of economic systems. Specifically, the main distinctive feature, as the authors believe, is the fast reaction to changes in the external environment. Signs of these changes become clear during the period when institutional mechanisms and laws are not yet effective, but transformation processes are already capable of forming prerequisites for the shift towards a new type of the economy based on knowledge. The authors have determined a complex of technologies mastered in the evolutionary sequence of the past three centuries, which leads to new principles of production organization and the beginning of the period of innovative development.*

**Keywords:** *nature, transformation processes, person, ecosystem, rational use, relations, interdependencies.*

which are based on a quantitative and qualitative increase in the development of the society's forces of production [4]. The technological evolution of the past three centuries can be divided into five stages (Figure 1).

## I. INTRODUCTION

It is necessary to consider theoretical prerequisites of the origin before reviewing transformation processes as the formation of a new type of the economy. Not a single economic theory can fully characterize transformation processes but empiric regularities make it possible to highlight a number of characteristics they have, namely (1) reduction in the portion of the agrarian sector and higher output in the manufacturing sector [1], 2) more people employed in various sectors of the economy and less people engaged in agriculture [2], (3) centralization of the economy shifts from rural to urban areas [3]. Global development has experienced a number of pre-industrial and industrial technological stages, with each of them being marked by certain features. Every technological stage constitutes a complex of mastered revolutionary technologies, innovations and inventions,

Revised Manuscript Received on October 30, 2019.

\* Correspondence Author

**Lyudmila Borsch\***, V.I. Vernadsky Crimean Federal University, Simferopol, Russia.

**Svetlana Yanova**, The St. Petersburg State University of Economics (UNECON), St. Petersburg, Russia.

**Diana Burkaltseva**, V.I. Vernadsky Crimean Federal University, Simferopol, Russia.

**Elena Vorobyova**, V.I. Vernadsky Crimean Federal University, Simferopol, Russia.

**Nataliya Apatova**, V.I. Vernadsky Crimean Federal University, Simferopol, Russia.

**Amina Zharova**, V.I. Vernadsky Crimean Federal University, Simferopol, Russia.

**Svetlana Gerasimova**, V.I. Vernadsky Crimean Federal University, Simferopol, Russia.

**Maxim Soldatov**, V.I. Vernadsky Crimean Federal University, Simferopol, Russia

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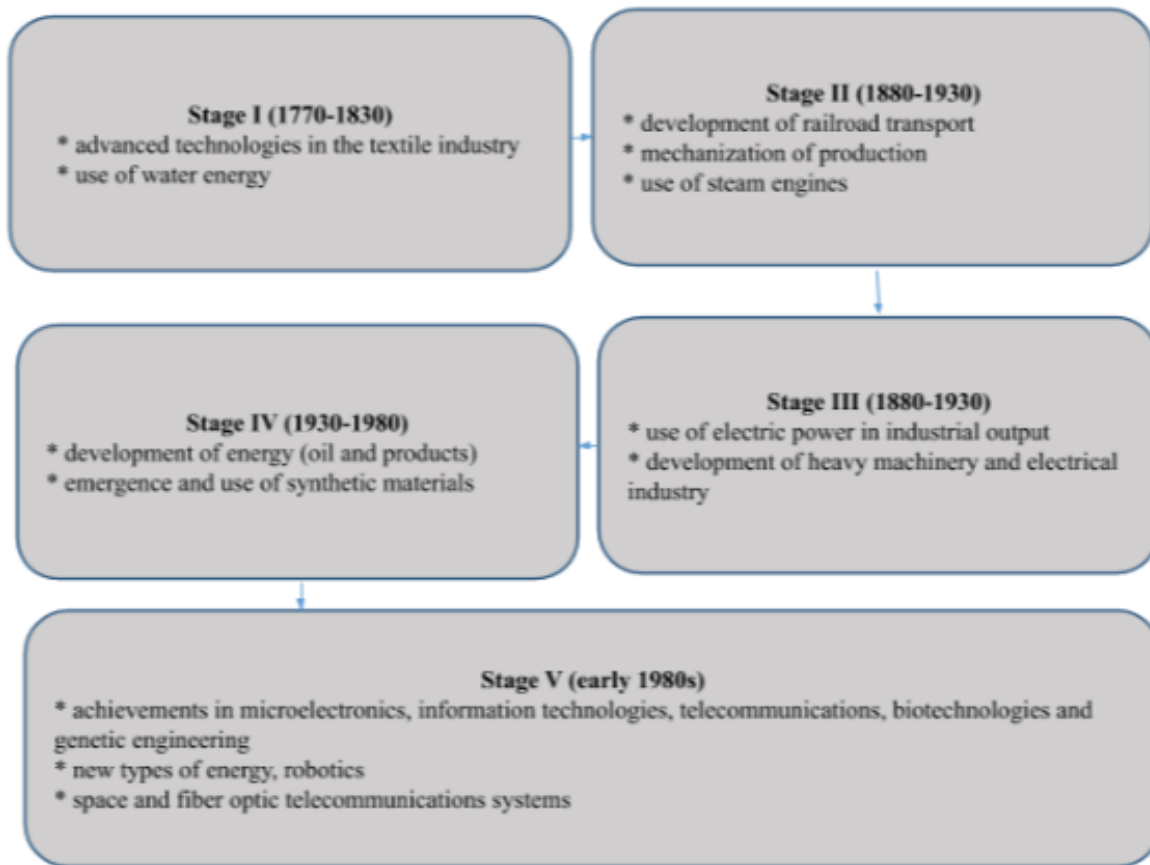


Fig. 1. History of changes in technological stages. \* Developed based on [5].

During the forecast Stage VI (2020-2060), computer technologies, nanotechnologies, biotechnologies and genetic engineering, multimedia, global intellectual information networks, superconductors and green energy will most likely come into the picture. For Russia, this is an opportunity for innovative development of its economy [6]. In addition to the aforementioned factors, the following will be playing a key role: health protection, development of sciences, availability and content of the information environment, high living standards, clearness of the environment, mankind's entry into the era of noosphere when the biosphere and the society will develop as a single organism [7].

## II. PROPOSED METHODOLOGY

### A. Block Diagram

In most developing countries, the transformation period was marked by unequal growth and inequality of income, except for Korea, Taiwan and China where the income ratio improved during this period. The transition from the traditional to the modern society suggests a number of changes in various spheres: the society, institutions and sectors of the country's economy – all these spheres substantially influence one's life, as well as the shift in values, standards and beliefs. Changes in the structure of production and urbanization adjust education, production and one's place in the society (Figure 2).

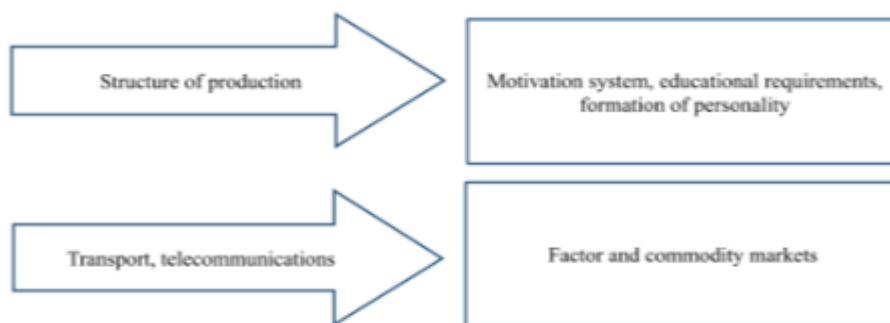
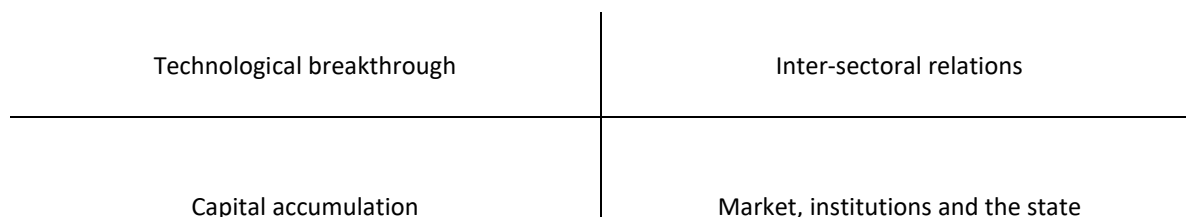


Fig. 2. Changes during the economy's transformation.

A transformational economy assumes changes in all spheres of socio-economic relations: control, the structure of the ratio between public and private assets, the structure of reproduction, institutions and legal relations. However, some scholars reduce transformation processes to three areas: liberalization, privatization and stabilization [8], [9].

### B. Algorithm

Economic works written in the past 50 years assume the differentiation of sources of transformation in four main areas of transformation even though viewpoints of economists from different times differ with regard to the aspects of impact on the transformation process (Figure 3).



**Fig. 3. Components of the transformation process.**

### III. RESULT ANALYSIS

*Technological breakthrough.* In the first place, it is essential to pay attention to an increase in technologies in the course of the production. The introduction of innovation in a technological process is the main condition in the course of transformation and the shift from the traditional to the modern economy.

Given the global experience, pursuant to Joseph Schumpeter's economic theory, his theory can be reviewed from the viewpoint of income generation processes through various combinations. [10-13] Schumpeter gives the leading role to entrepreneurship and human capital, highlighting innovation and development through "creative destruction" [14].

It is advisable to consider "creative destruction" from the viewpoint of the market economy, which can change constantly and improve from within through the natural replacement of obsolete models, as well as redistribution of resources for more advanced digital technologies [10].

Overall, industrialization can be shown as a process with changes in the structure and methods of production. William Arthur Lewis's concept is based on an entrepreneur, showing them as the main bearer of the idea of capitalistic rationalization. This theory is the first work, which showed proportionate growth of production in the industrial sector that leads to reforms in the economy [15].

The theory's essence is associated with redistribution of labor resources from the sector enjoying oversupply in favor of the economic sector that lacks the workforce. In most cases, industrial production is a leading sector while the agrarian sector lags: economic growth is possible through migration of the workforce that will lead to mono-economy, high labor productivity and full employment.

A dualistic model was developed by John Fei and Gustav Ranis [16] who highlighted the negative impact of the migration of labor resources from the agrarian sector, which dampens agricultural production rather than includes an inter-sectoral exchange.

The theory was followed by Dale Jorgenson who contributed to it by writing the following: if technical progress in the agrarian sector is not sufficient (for population growth and higher quality of products), the industrial sector can become economically unprofitable [17].

The theory of Simon Kuznets [18] shows the leading role

of agriculture in the transformation process, as an industrial revolution is always accompanied by agricultural development.

At the beginning of the 21st century, the theory was supplemented by Richard Tiffin and Xavier Irz [16] who indicated that in most developing countries the agrarian sector is the engine of growth, i.e. there is a direct proportional connection between agricultural development and economic growth. A countertrend is peculiar to the agrarian sector: weak productivity substantially limits overall economic growth.

A turning point for developing economies was the Green Revolution, which clearly showed that agriculture helps accelerate transformations within the entire economy. Experience gained by such regions as Asia and Latin America in the 1960-70s was characterized by the introduction of new agricultural technologies (irrigation, new breeds and fertilizers).

*Rapid capital accumulation.* Capital accumulation is always rapid as a result of higher productivity because most technologies include means of production.

Economists Simon Kuznets [20], Hollis Chenery [21] and Paul Rosenstein-Rodan [22] describe investment in industry as a means of rapid growth and transformation in low-income countries. The European economy recovered after the Second World War through investment in infrastructure. Studies lead to the conclusion that transformation is directly related to capital accumulation and the weight of investment in GDP for further industrialization and capital accumulation; the agrarian sector took the lead in funding.

As noted in works by Simon Kuznets [20], the main problem of economic growth is to extract a financial surplus from the agrarian sector for capital accumulation provided that the agrarian sector's balance is sufficient.

Unfortunately, the history of economics knows a lot of instances when developing countries damage their ecosystems and agrarian sectors by channeling cash flows into industrial output.

Not only capital accumulation leads to transformation in agriculture, although undoubtedly it plays an important role in its formation.

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Weak investment is mainly driven by long periods of profit generation in agriculture. Once a farmer gets the possibility of profit generation, the investment will rise.

### *Inter-sectoral connections.*

One of the first economists who pointed to the ratio between direct and reverse connections in economics was Albert Otto Hirschman [23]. The theory he proposed was based on the industrial sector's funding through capital investment.

Boris Johnson and John Mellor [24] broadened this concept by taking as the basis not only industrial production, but the relationship between agriculture and other sectors of the economy. According to the theory's basis, the agrarian sector is reviewed not only as the foundation of financial security but also as a source of development, employment and distribution of resources.

In many developed countries, the relationships between agriculture and other sectors of the economy are among the leading areas in the course of transformation. These relationships arise when agricultural output and consumption in cities and villages increase. The agrarian sector creates demand for fertilizers, and it becomes possible to boost output of premium agricultural products and increase sales at lower prices.

Transformations in the economic structure imply changes in sectors of the economy and a shift in the direction of operations in them. Expansion of the industrial sector is a top priority for the Russian economy, in which the development of manufacturing plays the leading role provided that new technologies are introduced.

It is necessary to note that the establishment of inter-sectoral relations in the country is substantially influenced by the absence of one or another type of production (fertilizers, young plants, nurseries, etc.). There are several

agricultural features: the place of vegetation, agroclimatic conditions, soil in a certain region. Bearing them in mind, local scientific institutions should engage in the development and developed new breeds should correspond to a particular country.

With the history of grape and melon production spanning for many centuries, the Crimea has always been committed to enhancing its breeds, forming resource-saving technologies of production and introducing scientific achievements. The Crimea's leading scientific organizations are the Federal State Budget Scientific Institution "All-Russian National Research Institute of Winegrowing and Winemaking Magarach of the Russian Academy of Sciences" and the Nikitsky Botanical Gardens of the National Scientific Center of the Russian Academy of Sciences. The "Gardening Development Program for the Republic of Crimea until 2025", which was proposed by the Nikitsky Botanical Gardens of the National Scientific Center of the Russian Academy of Sciences, targets to increase gross fruit output from 116,000 tons to 507,000 tons in 2025 provided that old gardens are stubbed, certified nurseries are created, biotechnological complex is established and storage systems are upgraded. This will make it possible to restore commercial horticulture in the Crimea by uniting scientific potential, production facilities, government support and investment [25].

The most favorable conditions for development have been shaping up for Russia, namely international demand for agricultural products gives a good chance for higher output. Russia is the world's biggest barley producer and the fourth biggest wheat producer (Figure 4). For some time now, it has been an exporter and the second biggest sunflower seed producer worldwide. [26].

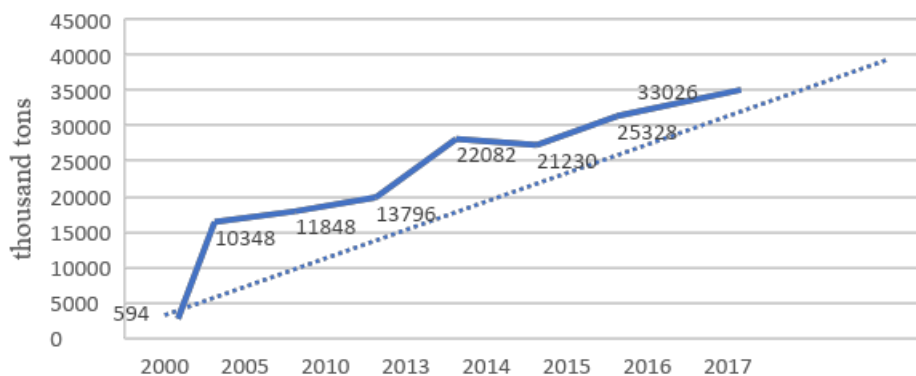


Fig. 4. Russian wheat exports, thousand tons [27].

The sector's export potential is characterized by higher sales of agricultural products. Russia holds ample areas, which are not cultivated, thus implying further development (with the confirmed positive changes and the high degree of likelihood (Figure 5)). In 2018, Russia's wheat crop reached a record 135.4 million tons, 40,000 tons were exported, and wheat exports doubled against the previous year. Russia holds leading positions, being a strong competitor to the United States [28].

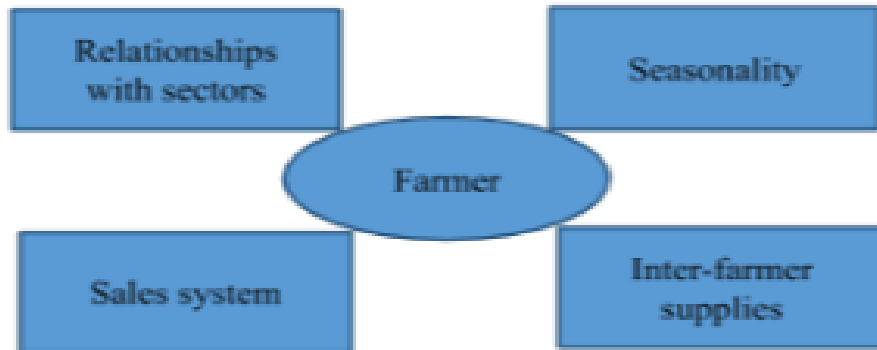
*The role of the market, institutions and state in transformation processes.* Market development and institutional changes are components of transformation

processes. Most economists believe that the difference between growth and transformation processes can be explained by the quality of an institution because it is one of the fundamentals for the elaboration of new technologies and innovation. However, it should be noted that the start of a transformation process does not always require institutional reform; it is more likely an integral part of the economy's transition from the traditional to the modern state.

The intensive use of modern resources results in technological changes in productivity. Given the main agricultural features shown in Figure 5, the whole production chain needs additional financing. Data in the aggregate become more important for the transformation.

Even the use of advanced resources and the output of new

types of agricultural products that substantially broaden the market and profitability, which at first sight seems to be integral to transformation, poses high risks to the operation of small farmers, dampening incentives for the introduction of new technologies.



**Fig. 5. Features of agriculture in the conditions of transformation processes.**

The transformation economy is changeable, which suggests certain features at the microeconomic level in the system of organization of public production. Later, it becomes fundamental for the industry as a whole and every enterprise as a separate economic entity. At the microeconomic level, the state plays a significant role in creating a further development strategy given the investment support, development of institutions, generation of competitive solutions, development of human capital and, undoubtedly, international trade at a high level.

In 2011, Russia approved the Strategy for Innovative Development for the Period until 2020, which aims to bring changes to human capital, innovative technologies, research and involvement in global processes for the Russian economy to make a transition to the innovative path of development. An important role in innovative development is played by regions, while the formation of innovative clusters can increase competitive ability of businesses through efficient interaction of the participants owing to their geographical proximity, the wider access to innovation, technologies, know-how, specialized services and highly qualified workforce, lower transaction expenses, as well as the execution of joint cooperation projects. Clustering is an efficient way of drawing foreign direct investment and integrating into the global high-tech market [29].

In 2017, Russia adopted the Digital Economy of the Russian Federation program, which is designed to create conditions for the development of the knowledge society, increase welfare and living standards of Russians by increasing the availability and quality of goods and services provided in the digital economy by applying advanced digital technologies, raising the degree of awareness and digital literacy, improving the availability and quality of government services for households, as well as security both inside the country and beyond its borders. The program will be executed until 2024 [30]. In addition, the Presidium of the Presidential Strategic Development and National Projects Council approved Protocol No. 16 "Passport of the

National Program "Digital Economy of the Russian Federation" dated December 24, 2018 [31]. Five basic areas for the development of the digital economy were determined: normative regulation, personnel and education, research competences, information infrastructure and security. The digital economy constitutes economic activities, the key factor of production in which is data in the digital form. It promotes the formation of the information space taking into account needs of the public and the character of the society in obtaining high-quality and reliable information, the development of information infrastructure in the Russian Federation, the creation and the application of Russian information communication technologies and the formation of a new technological basis for the social and economic spheres.

#### IV. CONCLUSION

Empiric regularities can fully characterize transformation processes where every technological structure is a complex of developed technologies, which are based on a quantitative and qualitative advance in the development of forces of production that will bring new knowledge of management to operations; the level of human potential will rise and a new corporate culture will be formed.

The transition to new principles of production organization, continuous innovative process and flexible automation of production facilities will get the modern society involved in the process. This process will lead to changes in various spheres of human activities. All of them can produce a substantial impact on human life, lead to the changes in values, standards and beliefs, as well as in the structure of production, adjust education and definition of one's place in the society within the ecosystem.

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It is necessary to focus further studies on intricate multi-level technological systems, as well as the identification of cause-effect dependencies, which determine the inflow of new knowledge to ensure economic security.

## ACKNOWLEDGMENT

The work was carried out as part of the research project by teams of the research laboratories of higher education institutions "Interaction of social institutions as the basis of Russia's economic security in the context of globalization".

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