

AMURCON 2021**AmurCon 2021: International Scientific Conference****TECHNOLOGICAL PRINCIPLES OF SUSTAINABLE
DEVELOPMENT OF THE DIGITAL ECONOMY**

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Abstract

The article attempts to analyse the technological principles and mechanisms of development of the digital economy, as well as the possibility of stimulating new technological trends as a factor of sustainable development of the digital economy. The purpose of this research is to develop theoretical principles of sustainable development of the digital economy and transformation of all its spheres. The general theoretical and methodological basis for studying the multifaceted essence of changes in the process of digital transformation of the economy are the principles of dialectical, evolutionary, systemic and synergetic approaches, as well as general scientific and special methods of economic theory designed to help identify the properties and patterns of economic transformations under the influence of the digital revolution. The driving forces of digital transformation are the development of new economic relations in the field of innovation, capital accumulation, savings, investments and optimal allocation of resources. The technological trend of the sustainable development of the digital economy is constant innovative transformations. The functional role of digital transformation is the development of the material and non-material base, the introduction of digital technologies and forms of activity in all sectors, as well as the intellectualization of the economy. As a result, the role of those types of economic activities that are associated with the production of innovative goods and services increases. The spread of new types of activities causes corresponding structural changes in industries. Technological changes reflect recognition of the fact that digital transformation directly determines the parameters of economic development.

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1. Introduction

The digital economy is characterized by high-performance capacities and an increase in the performance of hardware and mechanisms while reducing the costs of energy and natural resources. This is the fundamental advantage of the engineering and technical level of the tasks being solved, which are typical for the production of the digital economy. Digitalization allows us to conclude that it is one of the main factors in the radical restructuring of the technological structure of production, where the functional properties of production systems increase, especially when integrated with digital technologies. The functional purpose of the created set of unique industries and activities consists in the production of new economic benefits.

Digitalization pushes the limits of the technological basis of production, combines it with the technical base of the household and the cyberized home, as well as the social sphere. The possibility of homework is precisely a consequence of this aggregation of the technological basis of production and the household. This is the system-forming and integrating factor around which the new technological basis of the digital economy is developing. Digital technology, having penetrated the technological basis, changes the way economic activity is carried out, affects the entire production process. As part of the means of labour, the share of digital technologies is increasing, which will mark a revolution in the technological content of production as its basis. Digital technologies have spread to all stages of the production process and perform optimization, control and many executive functions. It generates an expanding amount of information in the process of production activities and allows you to get previously unavailable information. At the same time, digitalization has a transformative impact on all industries, infrastructures and the social sphere. It integrates economic processes, links together production, management, supply and sales.

The effectiveness of digitalization largely depends on the availability of a powerful information technology sector of the economy, capable of materializing information into economic resources and benefits. Here information is included in the production of material goods as its natural and most important component, embodied in new means, objects, objects of labour and consumption. At the same time, technologies of structural changes of information are being created, increasing the informational impact on all aspects of society's life. This sector is becoming a determinant element of the systems of formation, functioning and security of the new technological basis of the economy. On this basis, new factors that form the basis of endogenous economic growth are objectively created. At the same time, the mechanisms and goals of economic growth are being adjusted. The digital economy acts as a system that seeks to get as much new information as possible, analyses it and uses it to produce economic goods with high added value.

In modern conditions, it is constantly permeated by powerful flows of new information and innovative technologies that catalyse permanent processes of structuring and self-organization. In the process of self-organization, accompanied by the emergence of ordered structures at all levels, its stable equilibrium is constantly disturbed. As a result of these processes, there is a shift to a new point of dynamic equilibrium of the digital economy.

2. Problem Statement

The basis of the digital economy is, first of all, the dynamic development of digital technologies. New unique industries are being formed and developed, and the nature of economic sectors is changing. Based on digital technologies, the technological basis of the main types of economic activity in the economy is being changed. New areas of knowledge are developing and a large-scale transition to new platforms is underway. On their basis, organizational structures are being improved and the efficiency of production functioning is increasing. As a result of the formation of a new system of the social division of labour, the value of the resources used changes. The transition to new management methods increases the importance of human capital and increases the requirements for employees in terms of their qualifications, creative qualities, knowledge of technologies, criteria and ways to improve work efficiency. Digitalization creates new conditions for the improvement of human capital and ensures the integration of all spheres of human creative activity. Along with the rapid changes in the scientific industry, technological basis, production, consumption and needs, the development of the digital economy is accompanied by a permanent shift of the centre of gravity of human labour to the creative sphere and, accordingly, is characterized by a constant increase in the number of employees engaged in creative work. The development of the digital economy depends on the manifestation of all the creative abilities of employees. The deeper the digital transformation, the greater the universal development of human capital in the economy. The dynamic diffusion of innovative technologies and the high intellectualization of production factors combined with the creativity of human capital make digital transformation possible and necessary. The dynamic development of the digital economy has necessitated a transition from the intellectualization of individual spheres of production to the intellectualization of all types of activities in society. In the digital economy, an essential component of the technological basis is a set of new knowledge, which reflects economic practice in ideal forms.

3. Research Questions

The digital economy is characterized by the fact that as a result of a differentiated increase in the share of new information, the share of traditional economic resources decreases, while the total amount of resources spent in GDP decreases, and its volume increases.

A new principle of interaction of production factors is being formed and is operating, based on a positive feedback system that reduces the values of space and time. The development of critical industries, science and education, and the improvement of the quality of labour resources is determined by how effectively information is used as a strategic factor. Arrow (2012) wrote that knowledge is not just a useful and necessary good, but also an object of purchase and sale. Webster (2014) considers the changes taking place in post-industrial society not only through the prism of the formation of information as an economic resource but also comprehensively, integrating changes in several spheres of society: technological, economic, professional, cultural and spatial. In the new conditions, more than three-quarters of the value-added in the modern economy is produced through information. Innovative machinery transformed into intelligent technology is used in production. Information is a strategic factor of production, and the accumulation of information is carried out by the economic system itself. Masuda (1981) believed that innovations in information technologies are a hidden force of social transformation, which is expressed in a radical increase in the quantity and quality of information, as well as in an

increase in the volume of information exchange. The goods and services produced in the digital economy in many cases have a system-forming and innovative character (Castells, 1996).

Permanent changes in the industry proportion and the technological basis of the digital economy based on innovative technologies determine the conditions for breaking the previous stability and the possibility of transition to a new state accompanied by dynamic structural transformation (Zhironkin et al., 2020). Digital and technological breakthroughs are rapidly intertwining and moving into a single stream. At the same time, the movement of this stream carries the trend of intensive digital growth in society. This means the permanent development of digital technologies and their frequent change, sometimes leading to a qualitative renewal of the technological basis. As a result, the technological basis has an active transformative impact on industries, infrastructure and all sectors of the economy. In the process of forming the technological basis, the forms of economic and technological relations change, first of all, the forms of combining factors of production in the economy. A technological basis is a set of technological structures in the economy that make up its basis. They are characterized by integrated production platforms. They operate based on flexible production systems aggregated into a technologically integrated complex of coupled productions based on the achievements of microelectronics, computer science and biotechnology, new materials, as well as the latest renewable energy resources. At the same time, integration, convergence and intellectualization of various technologies are observed, their efficiency and productivity increase. the studied subject of the article.

4. Purpose of the Study

The purpose of this study is to develop theoretical principles for the sustainable development of the digital economy and the transformation of all its spheres.

5. Research Methods

The general theoretical and methodological basis for the study of the multifaceted essence of changes in the process of digital transformation of the economy are the principles of dialectical, evolutionary, systemic and synergetic approaches, as well as general scientific and special methods of economic theory, designed to help identify the properties and patterns of economic transformations under the influence of the digital revolution.

6. Findings

Under the influence of the digital revolution and the fourth industrial revolution, the cycles of updating the technological basis of the economy are decreasing (Schwab, 2016). Fundamental science is already determining the trends of updating the technological basis of the economy (Foster, 1986). Now, within the life of one generation of people, technological renewal of the economy is possible. This is reflected in the fundamental principles of the formation of national models of the digital economy (Zubarev & Gasanov, 2021). National economies are undergoing one of the most significant transformations in their history and are being transformed into digital economies. In the new coordinates of development, theoretical knowledge and digital platforms are turning into leading economic resources.

A new set of resources is being created in the digital economy, which serves as the basis for radical transformational processes that are gaining a dominant character (Tapscott, 2014). The active diffusion of digital technologies is changing the qualitative characteristics of economic activity in modern society.

The intensification of digital transformation processes in the economy is the process of creating the latest production system. It is based on digital technology platforms. Effective use of these platforms allows relatively reducing the need for traditional resources (labour, capital, land). At the same time, new effects are formed: availability in consumption and consumption in real-time. Digital platforms significantly restructure the distribution and redistribution systems in the economy. As a result, transaction costs are reduced. Completeness of information due to its accessibility reduces the consumer's choice costs.

The fundamentally creative nature of the new type of interaction, democratization and humanization of production change its parameters. Accelerated digital transformation is becoming dynamic and covers the entire production. In these conditions, the process of interaction of economic entities is sharply actualized. Based on digital technologies, a digital interaction environment and its accessibility for all economic entities are being formed. This contributes to the process of creating, distributing, exchanging business ideas and promoting them in the markets.

All conditions and factors in their concrete historical combination determine the internal structure of production. The dynamics of the correlation of conditions and factors in their specific modifications leads to the approval of certain dominant structures of product development. However, the real role of each of these factors is different. At the same time, the degree of their development and the actual relationship with each other are also different.

The increase in the volume of knowledge, the impossibility of their direct use in a production led to the division of science into fundamental and applied. The obtained fundamental knowledge and results are used in practice, subject to additional applied research and development. The development of exact sciences - mathematics, physics, chemistry, astronomy, as well as the formation of abstract thinking have raised the methodology of cognition to a qualitatively new level. The transition to additive manufacturing means a radical change in the technological method of production and the entire content of labour (Zhironkin et al., 2019).

The digital revolution, accompanied by the creation of digital devices, revolutionized the technological method of production. The content of the work has undergone radical changes and the definition of human physical functions is being completed. Since the machine is not yet perfect enough, it uses a person as a complementary link, adapting his physical and intellectual capabilities to its needs.

Energy supply is already carried out by multiple energy conversions. A qualitative leap is taking place in the organization of production at the beginning of the XXI century. But production cannot develop without the appropriate infrastructure, and then there is a service sector providing. In recent decades, there has been a significant increase in demand for services focused on providing the social needs of a person (retail trade, household services, medicine, culture, entertainment industry and others).

The most important scientific and technological achievement of the XXI century, which qualitatively changed the style and lifestyle of global society, was the creation of digital technologies and high-performance information processing and transmission systems. productions. The three-link system

of machines is complemented by a fourth link - a cybernetic device. Under these conditions, the intellectual functions of the individual are being objectified in the means of labour and the dominance of immaterial objects of labour takes place. This radical functional change in the content of work is evidence that a new digital revolution is underway. As a result of automation, a person ceases to perform a technological function and is partially intellectual, shifting them to the shoulders of machines, digital devices. There is a new type of communication "worker-technological processes", which opens up wide spaces before the development of production. In these conditions, the humanization of the modern economy is becoming more and more observed.

The era of the modern digital revolution is a transitional era when intellectual capital becomes the dominant condition of the economy.

In these conditions, there are changes in the paradigm of the economic system and the formation of a qualitatively new model of economic growth. Codified theoretical knowledge becomes the intellectual basis for the development of the digital economy, acts as a source of development of all its branches. Knowledge, managerial influences, qualifications, the creative potential of employees, digital technologies form the basis of new production. Digital information makes it possible to create huge amounts of data, the processing and dissemination of which contributes to the use of new knowledge to achieve strategic goals for the development of society (Osuga, 1989). In the new economic situation, a new main object of ownership appears - intellectual property and its results - intellectual goods and services. At the same time, a fairly stable trend of endowing the product with an intellectual image is being formed. This is also a distinctive feature of the product and the market within the digital economy. In high-tech industries, they produce goods that are "saturated with knowledge" more than their functional purpose suggests, perform work using advanced achievements of science and technology. The activities of such industries include research and development. In high-tech activities, the product has an original closed architecture, representing the know-how of the company.

The most important economic characteristic of the digital economy is the high level of knowledge (information) required for leading industries (Nonaka & Takeuchi, 1995).

A qualitative change in the role of knowledge in ensuring human economic activity leads to economic and digital transformations. So, already now the impact of digital transformation on the economic environment is considered as an integral part of it, which lead to changes in certain macroeconomic parameters. The rapid development of the digital economy allows us to say that at the end of the XX century and the beginning of the XXI century there is a change in the model of technological development itself. It should be noted that the discovery of microchips and laser optics occurred within the framework of quantum physics. Consequently, the digital economy, as an economy primarily high-tech, is usually associated with the discoveries of quantum physics. Speaking about the electronic basis of the economy, we mean digital technologies of the era of quantum physics, which created the prerequisites for the information technology revolution. It was on this wave that the world entered the XXI century. The theory of quantum physics has revolutionized the content, forms and speed of development of economic processes, predetermined the further growth of innovations in all spheres of the economy. The transition to a digital society is possible under the condition of the formation of a digital economy. At the same time, at the initial stage of its formation, its technological part will be based

on digital technologies. The current trend of the digital economy, which has allowed an employee to own the means of production (computer, information, access to information networks, means of copying, etc.), deprives the monopoly on industrial means of production. The limiting factor of modern production is knowledge. One of the urgent problems of digitalization is the fact that the data arrays accumulated by a separate firm often remain closed and are in limited demand. Access to them is conditioned by the requirement of payment. First of all, this creates barriers to the realization of the diffusion of knowledge, the matching effect of skills and the network effect, the improvement of "knowledge exchange mechanisms" and does not correspond to the transfer of new technologies, which, in turn, limits the accumulation of human capital.

The intellectual labour worker goes beyond the industrial worker since the product he offers is not labour. He already offers a complete, unique product created with the help of his digital means of production.

A new kind of personal property is being formed in the coordinates of the digital economy. It includes, first of all, knowledge and personal property means of production of workers. The object of their activity is a creative product, knowledge and skills for the organization, that is, for the production infrastructure. Personal property penetrates all branches and sectors of the digital economy.

A new contradiction between personal and private property is being generated, which is reflected in the social structure of society. The existing stratification of society is being modernized. At the same time, the contradiction between intellectual and industrial capital is growing.

However, the new form of any element of the system, having emerged and become dominant, does not cancel its predecessors in one fell swoop. Old, new and newest forms coexist. Not immediately, but gradually, only the most archaic forms die off. They have already turned out to be completely inefficient and costly in the new conditions. Thus, the emergence of each new group of innovative industries does not eliminate the production that arose at the previous stage, but only reduces their importance as carriers of scientific and technological progress. Similarly, at each new stage of evolution, the exchange is supplemented by a new form, which, becoming central, does not turn out to be the only one. The same thing happens with property. Consequently, in the real economic situation, different levels of ownership and entities occupying an intermediate position between these levels coexist. And all this is in continuous motion.

Thus, the change of factors of production occurs according to the laws of dialectical negation, that is, removal and simultaneous preservation. This means that the previous dominant conditions are included in the foundation. At the same time, there is a natural expansion of the innovative technological basis, the enrichment of production knowledge, because now it contains another factor or condition of production in a developed form (Gasnov, et al., 2019).

Within the framework of the digital economy, the social factor, which is one of the constant conditions for the functioning and progress of production, reaches its highest development through the digital revolution. The social factor becomes the dominant systemic condition for the development of the productive forces of society. It is quite natural and natural that the role of the social factor, social conditions reach its apogee only at the heyday of the digital revolution. Here, the solution of real social problems becomes possible, turning into the main goal -improving the well-being of society (Gasnov et

al., 2017). An essential feature of innovation processes in countries with a digital economy has become its socialization (Gasarov, 2021).

7. Conclusion

The technological basis of the digital economy acts as an open system in which there is always the possibility of a certain instability, leading to some new mechanisms. Consequently, the technological basis of the digital economy functions as an open system. The new basis is strongly influenced by the strengthening and weakening of innovations, the destruction of the system due to sudden jumps and dissipative structures. This technological basis is focused on dynamic changes and growing diversity in business and the economy as a whole. The increasing importance of the technological factor is due to the change in the principles of economic development in the era of the digital revolution, innovation orientation and trends, an increase in the level of education, economic culture, and the formation of a new economic system. The digital economy also presupposes a new quality of life, the development of society's creativity.

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