# Systematic process analysis: digitalisation of the economy in terms of the political economy approach

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ORIGINAL ARTICLE

**Abstract.** With the rapid development of information technologies, digitalisation is becoming a key factor in socio-economic development. However, the process of digital transformation involves a number of challenges, including changes in the nature of interaction between economic actors, transformation of reproduction chains, and redistribution of economic interests. At the same time, the issue of a comprehensive analysis of digitalisation in terms of a political economy approach remains insufficiently studied in the scientific literature. This research concerns with the digital transformation of the economy through the prism of political economy analysis. It allows us to identify the mechanisms of changes in economic interests, transformation of social reproduction structure and changes in the system of distributive relations. The political economy approach provides an opportunity to analyse the role of the state, corporations, and society in the process of digital transformation, examine the emerging economic imbalances associated with digital inequality, capital concentration and income redistribution in the digital economy. The purpose of the study is to comprehensively examine the processes of economy digitalisation in terms of the system-integrative analysis. The research considers the political economy approach in the context of digitalisation, the interests of key participants in the digital economy, transformation of reproduction chains, distribution relations, assessment of the impact of digital technologies on labour relations, and economic policy. The research methodology is based on the system-integrative approach, methods of logical, criterion, comparative, and structural-functional analysis. The main results of the study indicate the redistribution of economic interests, changes in the structure of social reproduction and the mechanisms of state regulation in terms of the digital economy. Indeed, digital transformation requires active state participation in the formation of digital institutions, regulation of new economic relations, and ensuring digital sovereignty. The practical application of the results obtained is possible in the development of digital transformation strategies.

**Keywords:** digital economy; digital infrastructure; digital environment; digitalisation of the industry; political economic approach; transformation of reproductive chains

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## Introduction

The modern economy is undergoing large-scale structural changes under the influence of digitalisation, affecting all spheres of economic activity. The introduction of digital technologies is changing traditional models of production, distribution, exchange, and consumption requires reconsideration of key economic patterns. The digitalisation of the economy causes a change of the capital structure, and an increase data and information technology influence, and the growth of intangible assets. The transformation of economic processes is accompanied by changes in reproduction chains. It is manifested in the transition to platform business models, labour automation, digital division of resources, and changing regulatory mechanisms. Moreover, it provides both new opportunities for economic growth and structural imbalances related to the redistribution of capital, changes in the labour market and the concentration of data on the large digital

platforms.

Therefore, the political economy approach becomes the most important tool of analysis considering a multi-level structure of interests (individual and state), the fundamental interrelationships between different subjects of the economic system, their interests and mechanisms of their realisation in the conditions of digital transformation.

Political economy analysis focuses on the economic interests of participants and on the mechanisms of their behaviour. Digitalisation is changing the balance of power between the state, corporations, and society, increasing competition for control over data, and redistributing profits to the owners of digital platforms. These processes require the development of new regulatory mechanisms capable to ensure the economic sustainability, digital sovereignty, and equitable distribution of resources.

The object of the study is the process of economy digitalisation through the prism of the political economy approach, impact of digital technologies on changes in socio-economic relations within the reproduction cycle.

The purpose of the research is to study the processes of economy digitalisation in the system-integrative approach.

The objectives of the research are as follows:

– to consider the characteristics of the political economy approach;
– to explore the interests of the participants using the example of key sectors of the national economy;
– to compile and analyse the interrelationship of interests at different levels;
– to study the political economy approach in terms of reproduction chains transformation;
– to assess the effectiveness of political economy approach.

The methodological basis of the research is built based on the general scientific principles of system-integrative approach, methods of logical, criterion, comparative, structural and functional analysis. Correlation and regression modelling and empirical analysis based on statistical data, international reports and national strategies for the digitalisation of the economy are used contextually. The sample covers data from the State Statistics Service of the Russian Federation and China, analytical materials of the World Bank and the European Union, data of Russian and foreign research centres.

## Main Part

### *The political economy approach*

The global economy digitalisation requires a comprehensive analysis of economic processes. The political economy approach provides unique tools for such analysis. It allows us to study the interests of various actors, i.e. individuals, corporations, society, and the state. The digital economy is a new form of economic activity. It concerns with the issues digitalisation effect on national and state economic systems. In political economy, the interests of different levels, such as the individual, corporation, society and the state, play a key role in formation of economic policy [4]. Indeed, these interests provide the vector of the national development.

### *Features of the approach*

According to the classical political economy, the interests of the individual, corporations, and society play a crucial role in formation of the economic policy and determines the vector of national development. A. Smith in his work "Research on the Nature and Causes of the Wealth of Nations" emphasised the economic development as the private interests of subjects contribute to the general welfare through competition and free market mechanisms [12]. D. Ricardo focused on the distribution of income between the main economic classes – workers, capitalists, and landowners. According to him, the structure of society has a significant impact on economic processes and the formation of a national development strategy [10]. J.-B. Say considered production in terms of the effective functioning of the economy, including state institutions [11]. The growing digitalisation and globalisation of the economy ensures the particular importance of the hierarchy of individual and national interests and their relationships with state and public interests. Indeed, this interaction provides the formation of the main economic strategies at all levels.

A political economic analysis in terms of the socio-economic interests and digital transformation allows ones to study the specifics of distributive relations. However, the interests of economic entities can be not only overlapping, but also contradictory. It provides the basis for economic and social tension. Therefore, the main focus will be on the analysis of interests at different levels, their interaction, the impact of these interests on the national development of key industries in the digital economy.

*Economic interests of the participants*

*Individual interests in terms of political economic analysis*

The fundamental level of analysis in political economy is the interests of individuals. It plays a key role in determining economic behaviour and decision-making. In the political economic context, individual interests are associated with maximising personal gain, wide range of factors, such as well-being, access to resources, working and living conditions, opportunities for self-development, and participation in public life [9].

The participants socio-economic interests allow us to identify specific mechanisms of interaction between the state, business, and society, as well as identify key factors influencing the development of individual sectors of the economy. In our opinion, the differentiated analysis contributes to more accurate forecasting of macroeconomic trends, assessment of the effectiveness of public policy, and identification of structural imbalances. Digitalisation, innovation, and changes in consumer behaviour transform industry processes in different ways. It requires industries specification and allows us to develop optimal management strategies and adapt to new economic realities.

Finance. In the financial sector, digital technologies ensure the convenience and security of financial transactions. The main digital solutions are digital mobile banking, contactless payment systems, and a fast payment system.

Mobile banking applications allow ones to make payments, transfers, and other transactions without visiting a bank. According to the Central Bank of the Russian Federation, in 2022, the share of non-cash payments in retail trade exceeded 70%. It indicates the widespread use of digital financial services among the population[1].

Education. In the digital economy, individuals can be focused on improving their opportunities through access to educational and professional resources. High-quality education determines the possibilities of personal and professional growth.

The Russian higher education system has been actively developing in recent years. According to Rosstat, there were 741 higher education institutions in the country in 2022; 4.2 mln students enrolled. The national project "Education" plans to establish 25 innovative university campuses by 2030. It will improve the accessibility and quality of educational services [9].

Electronic educational platforms such as "Rossiyskaya Electronnaya Shkola" and "Moskovskaya Electronnaya Shkola", "Electronniy Dnevnik", "Moye Obrazovaniye" are being actively introduced, providing access to interactive educational materials and contributing to improving the quality of education[2].

Healthcare. In the healthcare industry, digital solutions are aimed at improving the quality of medical services and increasing their accessibility. Innovative digital solutions include: the introduction of robotic surgeons, smart prosthetics systems. Artificial intelligence provides the remote diagnosis and comprehensive treatment. Big data processing systems and user's personal card are being implemented.

System "Ediniy cifrovoy kontur v zdravoohranenii na osnove edinoj gosudarstvennoj informacionnoj sistemy v sfere zdravoohraneniya" ensures the integration of medical information systems and remote interaction between doctors and patients. According to the Ministry of Health of the Russian Federation, by 2023, more than 70% of medical organisations will use electronic medical records. It will improve the

[1] *National Payment System: results of 2022. Central Bank of the Russian Federation. Source: https://www.cbr.ru/statistics/nps/psrf (accessed on 07.01.2025)*

[2] *Top 20 Russian online educational platforms, 2022-2023. Source: https://brandanalytics.ru/blog/top-20-education-2022-2023 (accessed on 12.01.2025)*

effectiveness of diagnosis and treatment[3].

Transport. In the transport industry, digitalisation is aimed at improving the safety and efficiency of transportation. Current digital solutions include: smart roadside assistance systems, unmanned vehicles, real-time traffic monitoring programmes automatic fare payment, online vehicle tracking.

Intelligent traffic management systems, such as the Automated Traffic Management System, can optimise traffic flows and reduce traffic jams. In Moscow, the introduction of such systems has reduced the average travel time by 12% and the number of traffic accidents by 15%[4].

Science and Scientific Services. The digitalisation of science helps accelerate research and increase its effectiveness. National repositories of scientific data provide researchers with access to large amounts of information. The Nationalnaya Electronnaya Biblioteka platform provides access to millions of scientific publications and documents. It contributes to the development of scientific research and knowledge exchange[5].

*The interests of corporations and companies*

Indeed, the corporations and companies are very important subjects of economic activity. The interests of corporations include the desire to increase profits, expand market positions, reduce costs, and maximise shareholder value [5]. In terms of digital economy, companies monetise data, create digital platforms, and develop new business models based on the use of digital technologies.

The political economic analysis of corporate interests also highlights the importance of strategic resource management. In the digital economy, data is becoming a key asset; the companies try to use it for improvement of their competitive position.

Industry. In industry, digitalisation optimises the production processes and product quality. The use of Internet of Things (IoT) technologies allows ones to collect data from equipment in real time. It promotes timely maintenance and reduces operational interruptions. The Manufacturing Execution Systems (MES) integrate data from various sources, ensuring transparency and control at all stages of production. Artificial intelligence predicts demand and optimises the supply chains.

In 2025, Severstal, Cherepovets, Vologda region, Russia implemented an AI analytics system based to forecast equipment failures. It reduces company repair costs by 10% and increased productivity by 5%[6]. In 2025, Severstal announced the launch of AI automated quality inspection system for rolled metal products[7].

Agriculture. Digital technologies in agriculture are aimed at increasing yields and sustainability of agricultural production. The use of unmanned aerial vehicles (UAVs) and satellite monitoring allows to control crops and soil. Farm management systems collect and analyse large amounts of data to optimise resources. Artificial intelligence is used to predict weather conditions and detect plant diseases.

In Russia, Cognitive Pilot company has introduced a fully unmanned AI cab-less tractor for autonomous navigation[8].

Construction. In the construction industry, digitalisation helps to increase the accuracy and efficiency of projects. Building information modeling (BIM) technologies allow ones to construct digital models of objects by integrating data on construction and materials. Drones and sensors data collection ensures monitoring of construction processes. Artificial intelligence is used to optimise work schedules and manage resources.

For instance, the construction company PIK, Moscow, Russia has implemented BIM technologies in its

[3] *The results of the transition to electronic medical records in 2023. Source: https://www.rosminzdrav.ru/news/2023/12/31/itogi-emk (accessed on 08.01.2025)*

[4] *Intelligent transport systems have reduced accidents on the roads. Source: https://www.comnews.ru/content/235937/2024-10-28/2024-w44/1008/intellektualnye-transportnye-sistemy-snizili-avariynost-dorogakh (accessed on 11.01.2025)*

[5] *TNational Electronic Library: About the project. Source: https://rusneb.ru/about (accessed on 05.01.2025)*

[6] *Severstal has implemented the technology of intelligent analysis of business processes. Source: https://severstal.com/rus/media/archive/2020-11-03-severstal-vnedrila-tekhnologiyu-intellektualnogo-analiza-biznes-protsessov (accessed on 05.01.2025)*

[7] *Artificial intelligence in production: what tasks can be entrusted to neural networks. Source: https://www.eg-online.ru/article/489532 (accessed on 07.01.2025)*

[8] *TDigitalisation in the agro-industrial complex of Russia. Source: https://www.tadviser.ru/index.php/Статья:Digitalization_in the Agroindustrial Complex_Russia (accessed on 10.01.2025)*

projects. It reduced construction time by 20% and costs by 15%[9].

Trade. In trade, digital solutions improve supply chain management and raise customer satisfaction. Warehouse Management Systems (WMS) use data to optimise the placement of goods and logistics. Big data analysis predicts demand and manage inventory. Artificial intelligence improves customer service and personalisation.

X5 Retail Group, Russia uses big data analytics to optimise product range and pricing. It causes a 5% increase in sales in 2024[10].

Finance. In the financial sector, digitalisation increases the security and efficiency of operations. Blockchain technologies ensure transparency and immutability of transactions. Big data analysis assesses credit risks and detect fraud. Artificial intelligence is used in algorithmic trading to provide personalised financial recommendations.

Sberbank, Russia implements AI system to assess customer creditworthiness. In 2023, it reduced application processing time by 30% and default rates by 20%. In 2023 Sberbank earned an additional 350 bn RUB due to the integration of AI into all business processes[11].

The IT Sector. In the IT sector, digital technologies are the foundation of innovation and development. Cloud services provide scalable resources for data storage and processing. Big data is analysed to identify trends and make informed decisions. Artificial intelligence is used in software development, cybersecurity, and the design of new products and services. However, it increases inequality and capital concentration, and requires additional regulatory mechanisms.

For instance, Yandex, Russia uses artificial intelligence in its services, such as Yandex.Search for and Yandex.Navigator, providing users with personalised and accurate information[12].

Ozon, Wildberries, VKontakte, and Sberbank corporations are actively using big data to design platform ecosystems. It allows them to control significant market shares and generate additional revenue through the use of digital technologies[13].

Therefore, digitalisation in various sectors of the economy increases efficiency, reduces costs and provides new business opportunities.

However, in terms of the political economy approach the special attention is paid to the interaction of corporations and the state. In terms of the digital economy, the government mostly has to regulate digital monopolies and protect consumer rights. At the same time, the interests of corporations and the state are often contradictory. The state strives to ensure the distribution of resources and the protection of public interests, while corporations focus on maximising their profits and reducing regulatory costs [5].

*The interests of the State*

At the highest level of the hierarchy of interests are public and state interests. They play an important role in shaping a long-term strategy for the development of the digital economy. According to the political economic analysis, the interests of the state are to ensure economic sustainability, social justice, and the protection of national sovereignty in the context of global digital transformation. Government interests include regulating digital markets, protecting citizens personal data, and developing digital infrastructure accessible to the population. However, access to digital technologies and resources is unevenly distributed. Therefore, the special attention is paid to protecting public interests in the context of digital inequality.

Education. Distance learning systems are being actively implemented. According to the Ministry of Education of the Russian Federation, by 2024 it is planned to supply all schools in the country to high-speed Internet. It will ensure equal access to digital resources for all students [1].

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[9] *Digital architecture, or BIM modeling in construction. Source: https://www.mos.ru/news/item/68340073 (accessed on 07.01.2025)*

[10] *Analytics in the X5 range: data becomes a business asset. Source: https://www.interfax.ru/business/2024/07/22/876543 (accessed: 13.01.2025)*

[11] *Artificial intelligence in finance. Source: https://developers.sber.ru/help/gigachat-api/ai-in-finance (accessed on 01.02.2025)*

[12] *Intelligence to help. Source: https://www.kommersant.ru/doc/7327008 (accessed on 10.02.2025)*

[13] *Who can become the leader of the global platform economy now. Source: https://www.rbc.ru/industries/news/666185c29a794797dcc32d8f (accessed on 05.02.2025)*

Government services. Digitalisation of public services significantly increases their accessibility and efficiency. The Gostech platform is an example of a unified digital infrastructure providing citizens with access to various government services, including healthcare, science and education, public transport, construction, housing and communal services[14].

In addition, state interests are related to maintaining national sovereignty in terms of the growing globalisation. Many states have challenges relating to the influence of transnational corporations controlling key segments of the digital economy. Therefore, the development of national digital security strategies and protection against cyber threats jeopardizing national economic and social stability plays an important role.

*Interrelation of interests at different levels*

Political economic analysis involves a deep understanding of the interrelationships between interests at different levels, from the individual to national ones. These interests do not always correspond, and their intersections often result in economic and political conflicts. For instance, national interests in ensuring the social justice may conflict with the interests of corporations in their attempts to maximise profits through the use of inexpensive labour or the introduction of technologies reducing the number of jobs.

Moreover, additional difficulties arise due to conflicts of interest in economic relations. The government regulates digital corporations to prevent the monopolisation of markets and ensure the security of citizens personal data. Indeed, digital corporations may resist such measures [14].

In addition, active state participation in the digital services market can cause a conflict of interests, since the state becomes both a regulator and a market participant. It can provide unequal competition conditions.

At the societal level, digitalisation also causes the conflicts of interest. For instance, the digital technologies in various spheres of life can contribute to economic development. Simultaneously, they can increase digital inequality between different social groups and regions. This can increase the social tension [7].

At the same time, the interaction of these interests determines the overall economic dynamics and sets the vector of the nation's development. In the context of digitalisation, the state and public interests should play a leading role in shaping economic policy aimed at ensuring sustainable development and social justice. The state should act as a mediator, able to coordinate the interests of all participants in the economy and develop conditions for their interaction within the framework of a unified development strategy.

*Transformation of reproduction chains political economy approach in terms of digital economy*

The reproduction process in the political economy approach is a central element of political economic analysis. It covers the entire chain of movement of a social product – from production to consumption. In the traditional economy, the production is closely related to physical goods and services at various stages of the economy [6]. However, in the context of digitalisation, the role of intangible assets such as data, information and technology are becoming increasingly important. The digital economy is transforming traditional production and exchange models, providing new opportunities for optimising production through automation and real-time data.

For instance, the introduction of the Internet of Things (IoT) into production. IoT allows enterprises to monitor production resources and processes in real time. It increases efficiency and reduces costs. The reproduction process in the digital economy also effects on the design of new types of goods and services based on digital technologies. It expands the possibilities of exchange and consumption[15].

*Digitalisation and distribution relations*

The digitalisation of the economy has a significant impact on distributive relations and reproduction process. The political economy approach emphasises the allocation of generated value between different population groups and economic sectors as the most important element of socio-economic development [3]. In the digital economy, data and information are becoming the main object of distribution. Platforms such

[14] *Gostech platform. Source: https://platform.gov.ru (accessed on 10.01.2025)*

[15] *Digital transformation: the Eurasian and international context. Eurasian Development Bank. Source: https://fci.eabr.org/upload/EDB_Digital-Transformation_2024-04-15_web.cleaned.pdf (accessed on 05.01.2025)*

as Yandex, Google, Amazon, gain control of these key resources, form new forms of monopolisation, and concentrate the capital.

According to political economic analysis, digitalisation changes the nature of distributive relations and establish new forms of inequality. Access to digital resources and technologies is unevenly distributed both between and within different countries. It requires the development of new mechanisms for regulating and redistributing. For instance, digital platforms monopolisation increases economic inequality, as a small number of companies control most of the data. It allows them to make super profits through exploiting digital technologies.

*Exchange and consumption in the digital economy*

The digital economy changes the production and distribution, and transforms exchange and consumption. In a traditional economy, the exchange process involves the physical transfer of goods and services from producer to the consumer. In the context of digitalization, exchange is increasingly provided through digital platforms and online markets. It simplifies access to goods and services. For instance, e-commerce developing rapidly. The volume of global e-commerce sales in 2024 will amount to $ 6.3 trln USD. It is 8.76% more than in 2023[16].

Indeed, digitalisation simplifies exchange and forms the new forms of interaction between the consumers and producers. For instance, the sharing platforms Uber, Airbnb, and Delimobile allow consumers to interact directly with each other without intermediaries. It changes traditional models of consumption and income distribution[17]. A political and economic analysis of these processes provides a deeper understanding of economic mechanisms transformation, social relations, consumption, and exchange.

*Labour relations and labour force reproduction*

The key element of the reproductive approach is the analysis of labour relations and labour force reproduction. In political economy, labour occupies a central place; the production of tangible and intangible goods is provided through it. In the digital economy, labour relations are undergoing significant changes. On the one hand, automation and robotisation cause the reduction of traditional jobs, especially in manufacturing and transportation. On the other hand, digitalisation provides new jobs in high-tech sectors and software development.

According to political economic analysis, digitalisation changes the structure of employment and the nature of labour force reproduction. The employees have to adapt to new working conditions, acquire new skills and engage in flexible forms of employment, such as freelancing or working on digital platforms. This provides new challenges for social security and labour rights protection, as traditional labour regulation mechanisms frequently cannot compete with the rapid changes occurring in the digital economy.

For instance, employees aim for equitable wages, better working conditions, and social security, while entrepreneurs and capital owners are focused on increasing profits and optimising costs. These interests often conflict with each other providing the social conflicts. In the digital age, these contradictions may worsen due to automation and digitalisation of workplaces as many employees are forced to adapt to new conditions or lose their jobs due to the replacement of their work functions by robots and artificial intelligence. An example of the transformation of employment by industry is shown in Fig. 1-2.

Agriculture, forestry, and fisheries. During the period 2017-2023, employment in this industry showed a steady downward trend: from 4,294 mln people in 2017 to 4,020 mln people in 2023. The decrease (about 6.4% in 7 years) is due to several factors:

– Automation and digitalisation. Precision farming technologies, unmanned tractors, and crop management systems has reduced the need for manual labour.

– Optimisation of agricultural holdings. Large agricultural companies use modern production

[16] *Global e-commerce trends 2024 in numbers. Source: https://www.proresultat.com/mirovie-trendi2024-v-cifrah (accessed on 07.01.2025)*

[17] *The economics of separation: how sharing platforms work. Source: https://b2b.oooeos.ru/articles/ekonomika-razdeleniya-kak-rabotayut-platformy-po-sovmestnomu-potrebleniyu (accessed on 07.01.2025)*

management systems. It reduces the demand for unskilled labour.

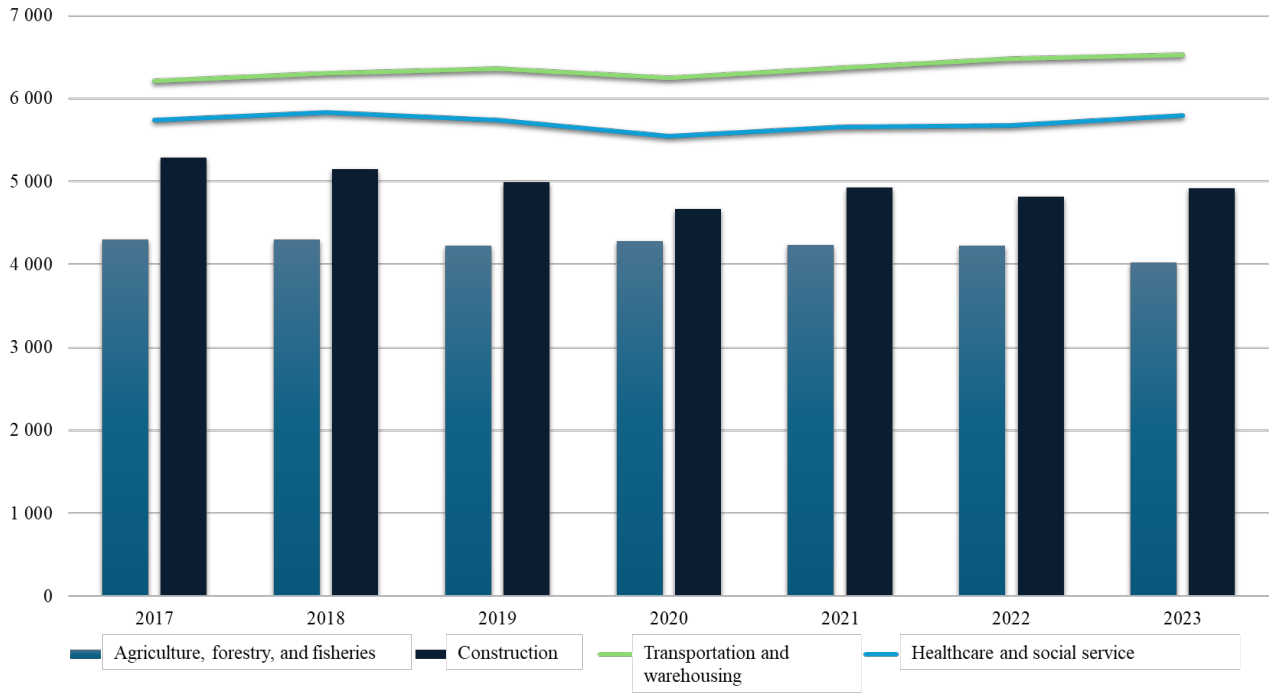


**Figure 1.** The number of employed by type of economic activity on average per year, thousands of people
*Source: https://eec.eaeunion.org/comission/department/dep_stat/union_stat/current_stat/labour_market/series (accessed on 10.01.2025)*

– Urbanisation and out-migration. The young working-age population prefers to work in cities. It reduces the supply of labour in agriculture.

Construction. Construction employment fell from 5.285 mln people in 2017 to 4.913 mln people in 2023; a decline is 7%. However, the industry is gradually recovering after a collapse in 2020 (4.666 mln). Major trends are as follows:

– The growth of housing construction. Government programmes to support mortgages and investments in infrastructure projects stimulate demand for construction services.

– Automation and digitalisation. The introduction of BIM technologies (Building Information Modelling) and automated project management systems increases productivity, but reduces the demand for low-skilled labour.

– Labour shortage. In 2022-2023, there was a shortage of qualified personnel in the construction industry due to the outflow of migrants.

Transportation and warehousing. Employment in the sector grew steadily from 6.210 mln people in 2017 to 6.528 mln people in 2023 (+5.1%). Growth factors:

– The growth of online commerce and logistics. The increase in e-commerce causes the higher demand for warehousing and logistics services.

– The development of transport infrastructure. The launch of new highways, the modernisation of rail and air contribute to the jobs growth.

– Digitisation and automation. The logistics management systems, unmanned vehicles, and intelligent warehouses reduces the need for low-skilled labour. However, it increases demand for IT specialists and engineers.

Employment in trade decreased from 11.586 mln people in 2017 to 11.286 mln people in 2023 (-2.6%). However, recently some stabilisation has been observed. Influencing factors:

– The rise of e-commerce. Online trading reduces the need for traditional stores and staff. However, it forms new jobs in the IT sector and logistics.

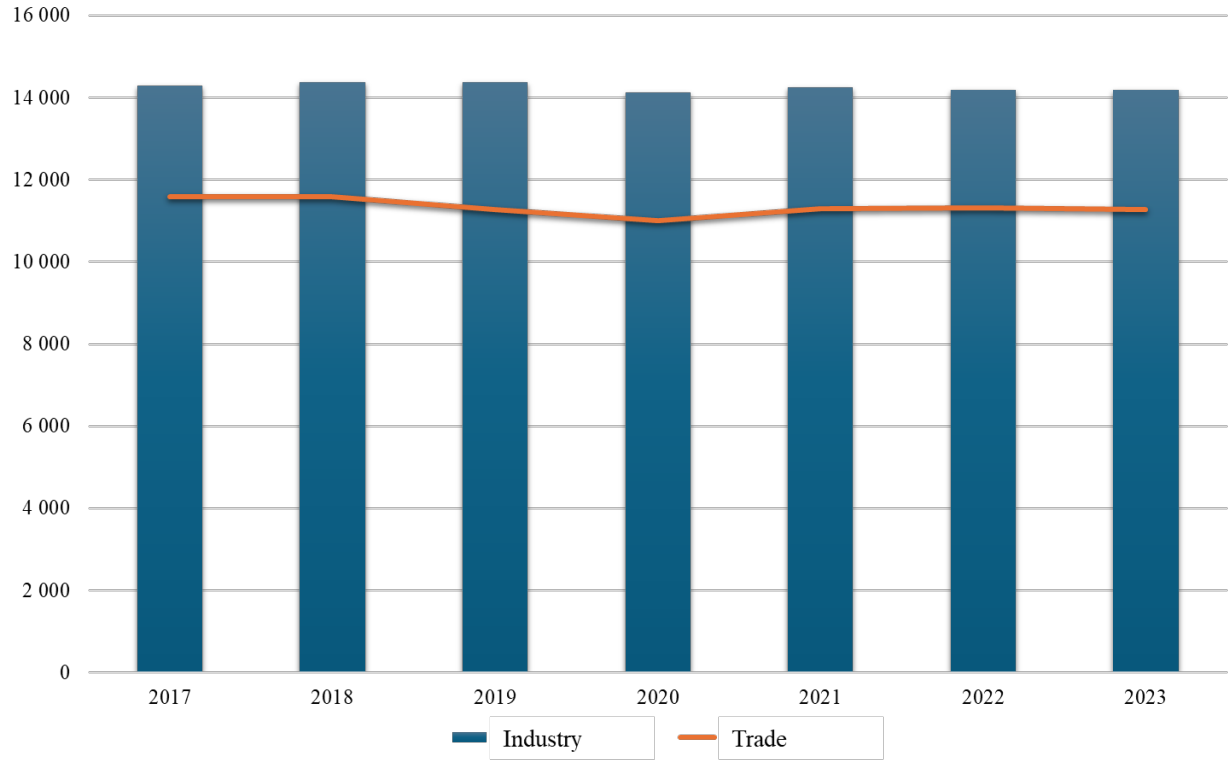


**Figure 2.** The number of employed by type of economic activity on average per year, thousands of people
*Source: https://eec.eaeunion.org/comission/department/dep_stat/union_stat/current_stat/labour_market/series (accessed on 10.01.2025)*

– Optimisation of retail networks. Large retail chains automate processes (for example, they introduce self-service cash desks). It reduces the need for the employees.

– Post-pandemic recovery. After collapsing in 2020 (10.999 mln), the market has gradually recovered to 2019 level. It shows the recovery in consumer demand.

Employment growth is the key trend during the period under study. The total number of employed in the economy increased from 71.116 mln people in 2020 to 73.636 mln people in 2023. It shows the recovery of the labour market after the pandemic-related crisis. Trends by industry:

– Reduction of employment in agriculture. The number of employees in agriculture, forestry, and fisheries decreased from 4,294 mln people in 2017 to 4,020 mln people in 2023. It can be result of automation of production and reduction of labour demand.

– Industrial stability. The number of employees in the industrial sector remained relatively stable, decreasing slightly from 14.299 mln people in 2017 to 14.191 mln people in 2023. However, there is a slight increase in employment in the manufacturing industry in 2023 (10.279 mln). It can indicate the industry's adaptation to new economic conditions.

– Growth in the field of IT and scientific activity. Employment in the Information and Communications industry increased from 1.296 mln people in 2017 to 1.430 mln people in 2023. A similar growth is observed in the professional and scientific activity segment (from 2.296 mln to 2,850 mln people). It confirms the trend towards digitalisation and an increase in demand for highly qualified personnel.

– Employment growth in education and healthcare. The number of employed in education increased from 6.908 mln people (2017) to 7.148 mln people (2023); in healthcare – from 5.739 mln to 5.798 mln due to the modernisation of social infrastructure and increased funding.

The data indicate structural changes in the economy caused by digitalisation, automation, and labour demand. The growth in high-tech industries and the expansion of social services demonstrate a strategic shift towards knowledge and innovation. The development of digital technologies helps to increase the flexibility

of the labour market, gives new opportunities for employment and self-realisation. However, it also requires adaptation and changes in traditional employment models.

A detailed comparison of the reproduction chains and their transformation within the framework of the political economy approach in terms of the digitalisation of the economy is presented in Table 1.

**Table 1** – Transformation of the reproduction chains of the political economy approach in terms of economy digitalisation

| Reproductive chains | Market economy | Information economy | Digital economy |
|---|---|---|---|
| The state of extended reproduction | Moderate extended reproduction | Moderate expansion through data and IT | Accelerated extended reproduction |
| The ratio of living and materialised labour | The predominance of materialised labour | The importance of information technology | The prevalence of intellectual labour and AI |
| Dynamics of the production factors | The predominance of material factors of production (labour, means of production). Low proportion of the information component (no more than 5%) | Significant growth of IT, knowledge as a resource. High proportion of information component >90% | Accelerated growth of digital technologies |
| Knowledge and skills | Moderate growth in the IT sector | Accelerated growth of IT competencies | Rapid growth of digital and information skills |
| The ratio of consumption and accumulation | Rationalisation of accumulation and consumption | Active data accumulation | Optimisation of consumption quality |
| The principles of Pareto | Cost-benefit imbalance | Imbalance due to data concentration | Cost-benefit imbalance minimisation |
| The scale of goods consumption | Moderate consumption of labour products | Increased consumption of information products | Accelerated consumption of digital goods |
| The law of diminishing returns | Inadequate development of production factors | The impact of network effects on productivity growth | Increasing returns to scale |
| The law of value | The exchange is proportional to the cost | Increasing the cost of intangible goods | Cost reduction through digital platforms |
| Market equilibrium | | | |
| | Restoring the disturbed equilibrium (supply, demand, price, competition) | Balancing through IT and data | Fast and variable recovery through the digital solutions |
| The prevailing type of economic relations | Market changes in terms of supply and demand | Hierarchy within the considered level (manager, firm, regional economy, national economy, global economy) | The platform type of economic relations (the economic system of the consumer, producer, communication core) |

| Reproductive chains | Market economy | Information economy | Digital economy |
|---|---|---|---|
| Leadership in the economy | Atomic market (small enterprises and companies) | Large enterprises | Small and flexible advanced enterprises |
| The ratio of producer and consumer influence | Shift depending on market conditions | The dominant of commodity producer | The dominant of consumer |
| Changing the sectoral structure of the economy | The predominance of key sectors of the economy | The predominance of high-tech sectors of the economy | Emphasis on the digital component |

*Source: Authors*

*The qualitative state of extended reproduction*

Within the framework of a market economy, the expanded reproduction of a social product occurs at a moderate pace. This is due to traditional production factors such as labour and capital limit the opportunities for rapid growth. According to World Bank data, in 1990-2010, the average annual growth in global GDP was 2-3%[18]. This is an indicator of stable, but not rapid growth.

However, in an information economy reproduction is accelerating. An example is the telecommunications sector; it grew significantly in the 1990s and 2000s due to digitalisation and the spread of the Internet. It causes an accelerated economic growth[19].

The digital economy demonstrates accelerated and expanded reproduction; the technological innovations allow companies and governments to effectively increase production capacity. Digital platforms such as Amazon or Alibaba show rapid growth in production and sales due to the scalability of technology. For instance, the annual growth of global e-commerce has been more than 15% since 2015[20].

*The ratio of living and materialised labour*

The traditional market economy is dominated by materialised labour associated with the production of physical goods and services. Information technology changed this ratio in the 1990s with the introduction of automated control systems and computer technology into production. For instance, the share of information technology in production processes has grown by an average of 5% per year since the late 1990s [15].

In the information economy, the role of intellectual labour is increasing; however, materialised labour remains significant. Companies are starting to use databases, information systems, and IT infrastructure to improve production management and increase efficiency.

The digital economy enhances this process, as the intellectual component of labour, including artificial intelligence (AI), begins to determine the decision-making matrix. The share of intellectual labour in the economy is growing rapidly, as digital technologies require qualified specialists working with big data, AI, and automation. For instance, research shows that 60% of global labour productivity growth in the 2020s is due to the introduction of AI and automation[21].

*Dynamics of the ratio of production factors*

In a market economy, the growth of information technology was moderate, especially before the 2000s, when IT was mainly an ordinary tool in production. The material component predominates. The share of the information component is less than 5%. However, in the 2000s, information technology began to emerge as a

[18] *World Development Report. Source: https://documents1.worldbank.org/curated/ar/630651468337159625/pdf/437380WDR0RUSS08B00PUBLIC0020090rus.pdf (accessed on 10.10.2023)*

[19] *Prospects for the development of the global economy: symptoms and treatment. Source: https://www.imf.org/~/media/Websites/IMF/imported-flagship-issues/external/russian/pubs/ft/weo/2016/02/pdf/textr.ashx (accessed on 24.12.2023)*

[20] *Li, S.M. Electronic commerce in China. The CAREC program. Source: https://www.carecprogram.org/uploads/Session-5.2-E_commerce-in-PRC-Seung-Min-Lee-ru.pdf (accessed on 01.07.2024)*

[21] *Prospects for the development of the global economy: symptoms and treatment. Source: https://www.imf.org/~/media/Websites/IMF/imported-flagship-issues/external/russian/pubs/ft/weo/2016/02/pdf/textr.ashx (accessed on 24.12.2023)*

critical factor of production, especially in services, telecommunications, and finance.

In the information economy the share of the information component is significantly dominated by more than 90%[22]. The companies invest in R&D to improve products and services. It has become particularly evident in healthcare and finance.

The digital economy shows accelerated growth in the share of digital technologies. The factors of production in the digital economy are related to the use of artificial intelligence, blockchain technology, and internet platforms. The share of digital technology in production is growing. For instance, in 2021, companies' spending on AI technologies increased by 40% year-on-year [15].

*Knowledge, skills, and the structure of human capital*

Information technology knowledge and skills are moderate growing in a market economy. Moreover, traditional jobs such as manufacturing and agriculture continue to dominate in the most countries. However, in the 2000s, the demand for IT professionals increased. According to the studies, IT job in the US have increased by 7-8% annually since 2000[23].

In the information economy, IT skills are very important. Employees should have knowledge of data analysis, programming, and information systems management. In developed countries, the demand for such skills has increased 1.5 times in the last 10 years [2].

In the digital economy, accelerated growth in digital knowledge and skills is becoming a key driver. Businesses are increasingly focused on employees capable of working with the latest digital technologies such as machine learning and data analytics. As of 2021, 80% of all new jobs in the technology sector require digital skills [15].

*The law of consumption and accumulation*

The law of consumption and accumulation regulates the balance between the consumption of resources and their accumulation for further use. In a market economy, this balance is rationalised through capital accumulation and improved quality of investment. Traditional approaches to accumulation involve the preservation of significant resources for sustainable growth in the future ensuring stable consumption. For instance, in OECD countries, the ratio of savings to consumption has remained relatively stable at the level of 30-35% of GDP over the past decades [9].

In the information economy, the role of accumulation and consumption is changing significantly due to the increasing importance of data. Companies are actively accumulating information to use it in the future to develop new products or improve existing ones. Data becomes a reusable resource, optimising accumulation and accelerating consumption. For instance, the cloud technology accumulate data and provide services based on big data, such as analytics and forecasting.

In the digital economy, there is an optimisation of the ratio of accumulation and consumption in terms of the quality of consumption. Digital platforms allow products to be adapted more quickly to market and consumer needs, reducing the time and material costs of accumulating resources. For instance, software subscription models such as Software as a Service (SaaS) allow consumers to pay only for features used. It improves the quality of consumption without the need for significant investment in savings.

*Manifestation of Pareto principles efficiency*

In a market economy, there is often an imbalance between inputs and outputs. For instance, traditional industries can be inefficient due to high resource and energy costs. According to the studies, up to 30% of production resources may be spent inefficiently[24].

In the information economy, this imbalance is increased due to the concentration of data in large companies. Large players such as Google, Telegram accumulate huge amounts of data. It allows them to

*[22] The ICT sector in Russia. Source: https://issek.hse.ru/news/227732702.html (accessed on 15.01.2025)*
*[23] Digital architecture, or BIM modeling in construction. Source: https://www.mos.ru/news/item/68340073 (accessed on 07.01.2025)*
*[24] Prospects for the development of the global economy: symptoms and treatment. Source: https://www.imf.org/~/media/Websites/IMF/imported-flagship-issues/external/russian/pubs/ft/weo/2016/02/pdf/textr.ashx (accessed on 24.12.2023)*

dominate the market and make super profits, while small companies cannot compete effectively. This intensifies the cost-benefit imbalance, requiring the development of new mechanisms for regulating and redistributing the resources.

The digital economy, on the other hand, helps to minimise the imbalance between costs and outcomes. Digital solutions such as automation and artificial intelligence enable businesses to significantly reduce costs, increase efficiency, and maximise the impact of their investments. Automation of warehouse operations at Amazon, where the use of robots reduced logistics costs by 20% and accelerated order processing [13].

*The extent of consumption of benefits*

The scale of goods consumption in a market economy is characterised by a moderate level of consumption of labour products. It increases in proportion to the growth of household incomes. It shows stable consumption of material goods such as food, clothing, and cars. In 2020, according to the World Bank, the average global consumption per capita is about $ 12,000 USD per year[25].

In the information economy, the scale of consumption is increasing due to the growing consumption of information goods such as software, content, communication services, and data. An example is the growth of digital content consumption. Therefore, according to PwC, the global digital media market will exceed $ 450 bn USD by 2025[26].

*Law of diminishing returns*

The law of diminishing returns, stating each additional unit of a resource in a market economy yields a diminishing return, is particularly evident in traditional industries. For instance, in agriculture or industry, the additional use of land or machinery results in lower marginal productivity. According to the statistics, the growth of production in most countries slows down, especially after reaching a certain level of capital investment[27].

This law is weaker in the information economy due to the influence of network effects. An example is the mobile app industry, where the more users connect to a platform, the more value it gains for each new entrant. Network effects minimise diminishing returns through increasing returns to scale.

In the digital economy, the law of diminishing returns is weakened even further by the scalability of digital products. Increasing returns to scale is becoming a key aspect of digital platforms, as adding new users and data increases the value of the platform for all participants, leading to greater impact. For instance, in a number of industries, notably China's automotive industry, digital services (including software, sensors, AI) generate the largest share of surplus value. China plans to have about 30 % car companies' revenues coming from services by 2030. Therefore, increased use of digital services in manufacturing of China is much higher on advanced manufacturing. It includes world leadership in robotic applications; China already has 1/3 of the world's inventory (more than twice the USA have). In addition, Chinese companies dominate the supply of 5G equipment. It also affects the growth of data-driven services[28].

*The Law of value*

The law of value concerns with the exchange of goods in proportion to their value and remains relevant in a market economy. An example is industrial production. Here the value of goods is strictly proportional to the costs of raw materials, labour, and capital.

In the information economy, this law is more complicated because of the intangible nature of many

[25] *World Development Indicators 2020. Source: https://databank.worldbank.org/source/world-development-indicators (accessed on 10.01.2025)*

[26] *Global Entertainment & Media Outlook 2021–2025. Pricewaterhouse Coopers. Source: https://www.pwc.com/gx/en/industries/tmt/media/outlook.html (accessed on 10.01.2025)*

[27] *Agricultural perspectives of the OECD-FAO 2016-2025. Food and Agriculture Organization of the United Nations. Source: https://openknowledge.fao.org/server/api/core/bitstreams/c15588f4-5f1b-434e-89da-bc8a6e2b84da/content (accessed on 10.01.2025)*

[28] *The 13th Five-Year Plan – China's transformation and integration with the world economy: opportunities for Chinese and foreign businesses. Source: http://www.iberchina.org/files/2017/kpmg-13fyp-opportunities-analysis-for-chinese-and-foreign-businesses.pdf (accessed on 10.01.2025)*

goods, such as data or software. The value of intangible assets often depends on the market value of information and network effects.

In the digital economy, the cost of goods is significantly reduced through digital platforms minimising transaction costs and provide mass access to products. For instance, due to the digital platforms such as the App Store, the cost of software has dropped significantly over the past 20 years, allowing millions of users worldwide to access innovative products at lower prices.

*Changing the reproductive world*

In a market economy, the disturbed balance is restored through market mechanisms: demand, supply, price, and competition.

Digitalisation and information technology transformed the basis of the economic system. The reproduction process in the digital economy is characterised by the acceleration of all stages: production, distribution, exchange, and consumption in a shorter time and at lower cost.

An example of this is the adoption of cloud technologies allowing companies to produce, store, and share information with minimal time and resources.

*The predominant type of economic relationship*

In a market economy, the predominant type of economic relations is market changes of conjuncture within the framework of supply and demand.

In the information economy, a hierarchy emerges: manager, company, regional economy, national economy, global economy.

The digital economy is characterised by a platform type of economic relations: consumer, producer, and communication core ecosystems.

An example of such an ecosystem is the My MTS app. It topped the ranking of Russian ecosystem apps in 2023 with 68.1 % in analysts' assessments. It provides centralised access to various services including detailed cost analysis and forecasting of future spending[29].

*Leadership in the economy*

In a market economy, the predominant atomistic market is small businesses and companies. Entrepreneurial initiative promotes the development of small forms of business. Consequently, there will be a formation of large enterprises.

*Large and major enterprises form a base of the analogue economy*

In a digitised environment, small, agile, cutting-edge enterprises predominate. In early 2025, China's DeepSeek demonstrated the importance of small, agile, and innovative enterprises in the digital economy. Founded in 2023, DeepSeek, with a team of 200 employees and a $ 6 mln USD budget, has developed an advanced AI model comparable to products from large Western corporations. In 2024, the company released the third version of its chatbot. It resulted in daily visits to their website increased from 280 thousand to 6.2 mln indicating a high demand for their product[30].

*The correlation of producer and consumer influence*

In a market economy, a shift of interest based on supply and demand conditions. When demand begins to dominate, there is a producer market.

In the conditions of modern market information economy there is the dominance of the commodity producer. The consumer chooses the market offers.

Indeed, in the digital economy production is customer-centric one.

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*[29] Statistics: The rating of Russian ecosystem applications was led by My MTS and Sberbank Online. Source: https://entermedia.io/news/statistika-rejting-rossijskih-ekosistemnyh-prilozhenij-vozglavili-moj-mts-i-sberbank-onlajn (accessed on 10.01.2025)*

*[30] What is DeepSeek and why it violates the order in the AI sector. Reuters. Source: https://www.reuters.com/technology/artificial-intelligence/what-is-deepseek-why-is-it-disrupting-ai-sector-2025-01-27 (accessed on 28.01.2025)*

*Changes in the sectoral-industry structure of the economy*

The predominance of basic key industries in a market economy.

The information economy is shifting towards high-tech and knowledge-intensive industries.

In a digital economy, the emphasis is on the digital component: high-tech industries are acquiring a digital element.

In 2022, Rostelecom was actively developing digital platforms and ecosystems, generating big data in the Russian segment of the Internet[31].

**Conclusion**

The modern digital economy is a complex and dynamic system with different levels of economic interests, from individual to macroeconomic and government policies. The analysis in terms of the political economy approach allowed us to identify the key features of socio-economic processes transformation under the influence of digitalisation.

Therefore, digitalisation entails changes in all spheres of the reproduction process. Manufacturing is becoming more intellectualised, dominated by intangible assets, including data and information technology. The distribution of economic benefits is increasingly dependent on digital platforms concentrating a significant part of value. It provides the implementation of new regulatory mechanisms. Exchange and consumption are also undergoing changes: traditional supply chains are shrinking and digital platforms are becoming the main intermediaries between producers and consumers.

Moreover, the digital economy is characterised by a number of key transformations: accelerated expanded reproduction, the prevalence of intellectual labour and artificial intelligence, accelerated growth of digital technologies and skills, optimisation in favour of consumption quality, minimisation of cost-benefit imbalances, accelerated consumption of digital goods, increasing returns to scale, etc. Cost reduction and fast, variable recovery through digital solutions contribute to a platform type of economic relationship. This causes to small and flexible advanced enterprises domination and centralises the consumer. The focus of the economy is shifting towards digitalisation, providing new opportunities for growth and development.

The political economy analysis paid particular attention to changes in labour relations. Digital transformation is boosting employment in high-tech sectors. However, it reduces the interest to the traditional forms of labour and increases the unequal distribution of jobs and incomes. Under these conditions, state policy should be aimed at adapting the education system, social security, and the labour market to the new economic realities.

An important component of the digital economy is changing the role of the state in economic regulation. On the one hand, the state acts as a regulator of digital platforms, balancing their commercial interests with the public good. On the other hand, the state is actively introducing digital technologies into the management systems. It increases the efficiency of public service provision and contributes to the formation of digital sovereignty.

The analysis of the political economy aspects of digitalisation concerns with reconsideration of the digital economy, traditional pricing, competition, and regulatory mechanisms. The growth of network effects and the monopolisation of data are shifting the centre of economic power, forming challenges for competition and social justice. In this regard, issues of redistribution of digital income and ensuring equal access to digital resources are of particular importance.

Hence, according to the political economic analysis of digital transformation, the key task of modern socio-economic policy is to coordinate the interests of various economic actors: individuals, corporations, society, and the state itself. The optimal combination of market mechanisms and government regulation can become the basis for the sustainable development of the digital economy capable to ensure both economic growth and social stability.

[31] *Platforms for connecting people and their deeds, meanings and things. Source: https://issek.hse.ru/news/832629300.html (accessed on 28.01.2025)*

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