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USE OF INFORMATION TECHNOLOGIES IN ECONOMY WITH A PURPOSE OF DIGITAL IMPROVEMENT

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Abstract

The article is dedicated to the study of the main trend of recent years, which is the transformation of science and technology into a single vector of development, which is accompanied by the occurrence of digital ecosystems, artificial intelligence technologies, and big data analysis. The process of shifting of the paradigm of the production activities organization towards the participation of third parties, distributed digital ecosystems and stronger digital partnerships is considered. The steps and stages of the innovation cycle of introducing information technologies into the economy are highlighted and their features are studied in the proposed article. An important feature of the innovation cycle is its consideration as a subsequent and continuous process taking place in time and consisting of logically interrelated steps and stages. The article highlights the importance of the digital ecosystem as a representation of a social and technical system in the form of a set of computer programs with distributed interaction and mutual use by agents in context of evolutionary self-development.

Keywords: Digitalization, digital technologies, production process control system, innovation policy, management, standard

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1. Introduction

Today, the transition to the digital economy is one of the main priorities for the development of Russia, because the level of digitalization will show the country's competitiveness in the new technological order. Therefore, in order to make our country to reach a new level of development of the economy, social sectors, we need our own scientific solutions and advanced developments.

It is necessary to develop the country in those areas where a powerful technological potential of the future is accumulating, and the most potential technologies are digital, other, so-called path-through technologies that today determine the appearance of all spheres of life.

In December 2016, President Vladimir Putin signed a decree as part of the Strategy for the Scientific and Technological Development of the Russian Federation, which provides measures to create legal, technical, organizational and financial conditions for the development of digitalization of the economy in the Russian Federation.

In July 2017, the Prime Minister of the Russian Federation has approved the "Digital Economy of the Russian Federation" program. This Program takes into account and comprehensively supplements the goals and objectives implemented in a number of adopted strategic planning documents, in particular, the forecast of the scientific and technological development of the Russian Federation, the strategy for the development of the information society in the Russian Federation for 2017-2030, and also fits into the framework of the Treaty on the Eurasian Economic the Union, according to which in the near future it is planned to create an integrated information system of the Union and a cross-border space of trust.

The Russian Federation needs to create suitable conditions for the implementation of modernization of the new technological order, substantiate rules that promote competition and market entry, identify skills that allow workers to take advantage of the digital economy, and identify institutions reporting to people in order to achieve maximum effect.

2. Problem Statement

Digital technologies are accelerating the speed of development. Measures that can make business and government more productive and innovative include the following: reducing costs, investing in basic infrastructure related to doing business, lowering trade barriers, facilitating entry of new companies to the market, strengthening antitrust authorities and encouraging competition between digital platforms.

To ensure biological and food security, our country needs a transition to a new type of agriculture based on a circular (i.e. waste-free) economy model and supporting the principles of sustainable development.

This "smart" agriculture will find application technologies for designing and simulation of ecological systems, automated decision-making systems, integrated automation and robotization of production. It is planned to reduce the use of external resources (fuel, fertilizers and agrochemicals) while maximizing local production factors (renewable energy sources, biofuels, organic fertilizers, etc.). The development of e-commerce creates favourable conditions for the Russian manufacturing market.

To help the innovative sector of our economy, a fairly extensive system of development institutions has been created (state corporation Bank for Development and Foreign Economic Affairs

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(Vnesheconombank), OJSC RUSNANO, OJSC Russian Venture Company, Special Investment Contracts (SPIC), OJSC Russian Investment Fund information and communication technologies "), which has significant financial resources.

Since today, various measures taken by the country's leadership have not provided significant results: Russian economy is still focused on the export of raw materials, and the lack of incentive mechanisms to promote the development of innovative activities of economic entities is one of the main reasons for the lack of progress in the country's innovative development.

3. Research Questions

The following new technologies which are already being introduced in the world, ensuring the strategic development of national economies have great potential for development: platform companies - the basic link of the new economy, providing the technological ability to realize the value proposition for the client based on the use of open source solutions, machine learning, cloud technologies with a given level of security.

New industrial technologies for Industry 4.0 - enhanced integration of "cyber physical systems" (CPS) into factory processes; new logistics based on standard infrastructure solutions (Uber, car sharing, drones); smart contracts - an opportunity to simplify and increase the reliability of the implementation of B2B, B2G transactions; digital money and new financial technologies that ensure the formation of a two-tier banking system; digitization of information and its' tying into systems (graphs) that compete with each other - a new era in the search for and access to information; neurocomputer interface; biotechnology, genetic engineering (Ivanova, 2015; Jeston & Nelis, 2010).

It is extremely necessary to create a cultural environment of the digital economy in the form of standards, laws, norms and rules, one of which is associated with the decision that digital forms of official interaction shall become the first, and analogue forms the second, including at the interstate level, as well as at the levels of interaction between states and business, citizens and businesses, suppliers and customers of goods and services. Digital steps to mobility, sociality, big data and cloud computing are more than just technologies to be implemented. Their action is associated with the expansion, and in some cases the complete replacement of traditional operating models and processes with digital ones.

At the present stage of development of production management systems and systems for the distribution and planning of resources, significant difficulties that are usual for enterprises operating in conditions of high dynamics (in transport-oriented systems, etc.) are arising. Uncertainties can be associated with problems of accounting of many different factors, such as the need for an individual approach to each order, the dynamics of prices for components, the variability of supplies from allied enterprises, delays, continuous changes in technology, the occurrence of various unforeseen events that directly affect the production processes of the enterprise. in general, etc.

Existing production control systems have a wide functionality and the ability to integrate the executive modules.

They accompany production processes from release to delivery formation. However, they do not have tools to support decision-making and responding to dynamic changes in the situation.

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Thus, maintaining production plans in an adequate state at all levels becomes an urgent task taking into account the uncertainty of the time and nature of changes.

Thus, maintaining production and distribution plans in an adequate state at all levels of transport-oriented and spatial systems becomes an urgent task taking into account the uncertainty of the time and nature of changes. Modern integrated production systems must respond flexibly and quickly to events, take into account the distributed nature of most control subsystems and the lack of centralization in them, independently make decisions about correcting and countering unforeseen situations and issue updated agreed plans.

In order to account unforeseen events, uncertainties, price dynamics and resource availability, multi-agent systems are becoming widespread. The current schedule in these systems is built using task and resource agents interacting by sending messages in networks of needs and opportunities based on self-organization.

As a result, it can be said that for the qualitative growth of the economy, it is necessary to have technologies that make it possible to assess the current state of markets and industries as accurately as possible, as well as effectively predict their development and ensure a quick response to changes in the conjuncture of national and world markets. Digitalization affects all the main markets that exist at the moment, and also contributes to the emergence of new markets, most of which will be of a network nature. Russia focuses on those markets that make it possible to create industries of a new technological order that are significant from the point of view of ensuring the national security and a high standard of living for citizens.

4. Purpose of the Study

The digitalization of the economy is ensured through the automation of all processes and data processing technologies.

Tools such as the Internet of Things, big data, artificial intelligence, machine learning, cyber-physical systems, monitoring systems, blockchain, neural networks, robotics, 3D modeling, virtual reality, cloud computing and many others contribute to the digitalization and integration of all data streams to create information society (Akhmetshin et al., 2018; Morozova et al., 2020; Vasilev et al., 2020).

The creation of digital platforms for managing the economy is a strategically important task, the solution of this task can not only restore material production, lay the foundation for the introduction of future innovations, but also ensure the advanced development of Russia, which is now only catching up with the advanced Western countries.

It is important to develop a qualitatively different level of the economy in terms of composition and structure, therefore, it is necessary to recognize the creation and development of new enterprises, support for start-ups that will be focused on the global market and will be viable in the context of global digital competition, path-through automation of all major production and economic processes, market development personalized production and consumption, increasing the aggregate efficiency of economic agents, mobilizing knowledge through exchange, creating new jobs in high-tech industries.

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5. Research Methods

The "management core" must include the equivalent of the "control device" from technical cybernetics (Armstrong, et al., 2011; International Organization of Standardization, 2008a, 2008b). In other words some regulator (a manipulator-comparator) that takes the role of an aggregator of certain relations and deals with issues of concluding contracts, supporting business and production within the framework of the regulatory field and objective reality, expressed not only by the physics of processes, but also by the will of society in the name of obtaining certain benefits and opportunities (Akperov et al., 2013). In fact, various software and hardware control systems, for example, MES or ISA group standards, can act as equivalents.

MES (manufacturing execution system) is a specialized application software designed to solve problems of synchronization, coordination, analysis and optimization of production within the framework of any production. MES-systems belong to the class of shop floor management systems, but they can also be used for integrated production management in the enterprise as a whole. Manufacturing Enterprise Solutions Association International (MESA International) defined the MESA-11 model in 1994, and the c-MES model in 2004. These models complement the production and manufacturing management models and standards that have emerged over the past decades:

ISA-95 standard, "Enterprise-Control System Integration", which defines a unified interface for interaction between production management levels and a company and work processes of production activities of an individual enterprise.

ISA-88 standard, "Batch Control", which defines technologies for batch control, recipe hierarchy, production data.

Cyber-physical systems and standards in the proposed model of building the implementation of modern information technologies act as a technological basis, predetermining not only the nature of the architecture, but the limits of functionality.

An objective feature is identified from the “possible” category in the field of systems analysis in the manifestations of the “management core” of the considered principles is important for adequate functioning in resource-oriented and virtual systems, defining the true side of the emergence of previously inherent relationships or properties (Malkin, 1966; Rosenthal & Jones, 2021).

6. Findings

The mechanism of using information technologies in the economy includes the main part, expressed in a number of successive stages. The most significant of them are:

- research of the demand for the company's products, determination of the market capacity and perspectives for its development;
- research of markets for required resources;
- planning and organization of innovative activities;
- staffing support of innovative activities;
- comprehensive analysis of the effectiveness of the introduction of innovations and associated risks.

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The main goal of planning innovation policy is to unite all project participants to perform a set of works to achieve the final result. Since innovation activity differs significantly from mass production, traditional planning techniques cannot provide correct indicators for the planned and actual periods. Therefore, while planning innovation policy, both general approaches to planning and principles specific to innovation are used:

- goal-setting principle (when not only the main goal is determined, but also a set of sub-goals, and the made decisions are evaluated from the point of view of their optimal combination);
- consistency principle (principle where innovative process is considered as a complex dynamic system that includes interrelated elements). This makes it possible to describe the innovation process using dynamic economic and mathematical models;
- uncertainties principle (principle that takes into account systematic and random factors that affect the process, while ignoring the random factors reduces the reliability of the analysis);
- adaptability principle (this principle implies the ability of an enterprise to accept one or another innovation;
- endurance principle (this principle provides accounting of not only the increased consumption rates of various resources in the process of innovation, but also the creation of a safety stock of the resources involved in the process in case of an unforeseen situation).

In process of innovation activities planning and organizing, a project viability is assessed. This assessment includes the following types of analysis: technical, commercial, financial, environmental, organizational, social, economic. For each type of analysis, a separate method is developed and the amount of required information is determined.

Most often, at the initial stage, it all comes down to creation of a formalized model for organization of the digital interaction of an ecosystem or enterprise.

The feature of the innovative process in relation to the object of management (“core”, enterprise system, ecosystem) includes “three aspects”:

1) disclosure of the content of the innovation cycle;

2) clear idea of innovations in terms of their subject (material) content;

3) identification of the features of innovation and scientific and technical developments aimed at creation of innovations.

It is possible to control any process only when the main directions of its development are known, the peculiarities and patterns of the controlled object are known”. Therefore, it is necessary to investigate these aspects in more detail.

7. Conclusion

Thus, as a result of the analysis, it can be concluded that the peculiarities of the introduction of information technologies into the economy have an impact on the ability and receptivity of society to practically use innovative knowledge. This, in its’ turn, is reflected in the methods of innovations planning, their financing, evaluation and control. And the considered aspects, characterizing innovations in terms of content, underlie the practice of selecting innovative topics, forecasting, planning, financing, stimulating

and evaluating efficiency as a practical basis for the implementation of information technologies in the context of digital transformation of the economy.

The well-functioning of the innovation mechanism, the joint functioning of these elements are largely determined by their interdependence, correlation and proportionality.

The correlation and structure of these elements, the significance and optimality of forms, methods and measures shall correspond to the level of management at which individual innovative work is carried out.

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