Digitalization as a factor in the development of innovative technologies in the fuel and energy complex of Russia

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Abstract. The purpose of this study is to identify the main trends in the use of digitalization achievements in the fuel and energy complex of Russia and ways to stimulate innovative technologies by reducing the risks of “digital” projects in modern conditions. The object of research is the role of digitalization in the development of innovative technologies. The subject of the study is the specific features of the introduction of digitalization to stimulate the innovative development of the fuel and energy complex of Russia. To achieve the goal, the following tasks are set: 1) to analyze the fundamental trends in the use of digitalization achievements in the fuel and energy complex of Russia; 2) to identify the results of the introduction of modern digital technologies and the role of digitalization in the innovative development of the fuel and energy complex of Russia in modern conditions. The mechanism of risk reduction in the implementation of “digital” projects to stimulate innovation in the fuel and energy complex of Russia is proposed.

1 Introduction

The development of digitalization makes it possible to efficiently and efficiently process data from energy facilities and information from automated information systems of fuel and energy companies, identify failures, increase the speed and efficiency of managerial decision-making, and introduce innovative technologies [1].

At the same time, the fuel and energy complex has features, primarily related to production and technological processes, the need to reduce the risks of innovative technologies associated with the introduction of “digital” projects.

2 Figures and tables

The purpose of the study is to identify the main trends in the use of digitalization achievements in the fuel and energy complex of Russia and to identify the results of the
introduction and ways to stimulate innovative technologies by reducing the risks of implementing “digital” projects in modern conditions [3]. Global trends in the use of digital technologies contribute to the development of innovation, the introduction of scientific developments, and the development of high-tech industries in all sectors of the economy [12].

Currently, in terms of the use of digital technologies, Russia is still characterized by an insufficiently high level of susceptibility of organizations to the introduction and use of cloud services, Internet of things, artificial intelligence technologies, and big data analysis compared to other countries (figure 1) [6].

![Fig. 1. Use of digital technologies in organizations by country (2020), % of the total number of organizations.](image)

However, according to experts, by 2030, Russia's GDP growth by almost 50% will be due to the processes of digitalization [4; 5]. This is evidenced by the positive trends in the introduction of digital technologies in Russia, namely:

- The gross domestic costs of digitalization of various sectors of the Russian economy in 2019 amounted to 3.7% of GDP, of which more than 60% of the total volume were expenses of organizations, a large share (about 58%) of these costs were directed to the purchase of domestic software, which plays an important role in the conditions of sanctions.
- In 2020, about 90% of organizations used broadband Internet, and 20% of organizations implemented automated information systems.
- Digitalization has become most widespread in the field of online interaction of business with authorities in 2020 in the financial sector, in the field of information and communications, in manufacturing and energy supply enterprises (figure 2) [7]
As noted earlier, digitalization in various segments of the fuel and energy sector of the economy has its own specifics.

Earth remote sensing technologies and geoformation systems based on 3D modeling are used in conducting prospecting and exploration work [8].

To reduce costs in the oil and gas sector, digital technologies focused on “cognitive expert decision support systems” (“digital upstream”), the implementation of projects on hard-to-recover reserves (“digital field”), which allow the introduction of modern digital technological solutions, are becoming particularly relevant. Such digital technologies include the application of:

- 3D visualizations.
- “Digital” doubles.
- Remote control of technological facilities.
- Internet of things for data transmission for the safety of workers (“smart” helmets, gas analysers, environmental sensors, pulse and location) [9].

In the coal industry, the main goal of digitalization is to optimize the production chain, from mining to the supply of resources to the consumer. Projects are being implemented for this purpose:

- “Digital mine”.
- “Digital quarry”.
- “Digital supply chain management”.

The use of a corporate Wi-Fi network, geolocation technologies and gas measuring devices ensures remote monitoring of workers, equipment and air quality in mines [11]. Based on the data obtained, mathematical models are built, with the help of which technological decisions are made, which will allow the further introduction of robotic systems.

In the electric power industry, digitalization is aimed at:

- Ensuring the reliability of power supply, developing modern ways of interacting with consumers (creating “smart” networks).
• Distribution of “digital substations” with a high level of automation of all information exchange and management processes.
• Creation of platforms for collecting, processing and using big data for applied research purposes.

3 Results

According to experts, as a result of the introduction of digitalization at domestic enterprises of the fuel and energy complex, it is predicted to achieve the efficiency of their activities, reduce accidents, increase energy efficiency and safety [13]. For example, the introduction of “digital” projects, electric power companies can achieve:
• Revenue increases up to 3%.
• Reduction of capital expenditures up to 5% and operating expenses up to 7%.
• Reduction of the average frequency of technological process violations up to 5%, accident rate up to 20%.

At the “digital fields” of the enterprises of the domestic oil and gas complex, an increase in the oil recovery coefficient is predicted from the introduction of digital technologies (ORC) from 5% to 10%, reduction of operating costs by 10% and capital costs by 15%. In turn, remote control of production facilities allows mining companies to increase the energy efficiency of production and reduce logistics costs. The use of digital technologies based on real-time data analysis in the Russian coal industry can provide an increase in production by 5-7% and increase the level of mining safety [14].

Fluctuations in the global export and import markets, the introduction of sanctions, tightening of financing conditions by creditors led to a weakening of the investment activity of business entities for the introduction of digital projects, especially at the expense of internal resources of companies.

The implementation of the mechanism of “digital” innovative projects has its own specifics not only at various stages, but also at the level of each participant [15-21]. Uncertainty in the energy markets, geopolitical risks and complex technologies in the fuel and energy complex reduce investors' interest in technological projects with long implementation periods in Russia.

It is at the investment stage of implementation that the most preferred option for financing the project is selected and the mechanism of interaction of its participants is built, taking into account organizational and legal features, investment directions, risks [13].

In Russian practice, there are already developed credit products for such projects in the form of project financing and investment lending. Project financing involves large investments and cash flows for servicing debt obligations, risk distribution between participants, long implementation periods (up to 5-7 years).

Investment lending is focused on servicing debt obligations at the expense of the economic activities of the borrowing companies. In this regard, it should be noted that insurance can act as an independent way of transferring and reducing risks for participants of innovative projects (table 1) [11; 22].

To calculate insurance premiums depending on the object of insurance in innovative projects, you can use a formula that reflects the following dependencies:

\[ P = \frac{T \times K \times S}{100\%} \]  

Where P - the insurance premium (insurance premium); T - the insurance rate; K - an increasing coefficient that takes into account the riskiness of the investment project (1.3 – 2.0); S - the sum insured (insurance value).
Authors should use the forms shown in Table 3 in the final reference list.

**Table 1.** Objects of insurance of investment projects.

<table>
<thead>
<tr>
<th>Object of insurance</th>
<th>Determination of insurance amounts and losses</th>
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</thead>
<tbody>
<tr>
<td><strong>Property insurance</strong></td>
<td></td>
</tr>
<tr>
<td>Means and objects of labor</td>
<td>The actual value of property-related objects at the time of conclusion of the insurance contract</td>
</tr>
<tr>
<td>Money resources</td>
<td>The volume of credit (monetary) resources increased by the amount of interest</td>
</tr>
<tr>
<td>Losses from the implementation of the project</td>
<td>Assessment of actual losses</td>
</tr>
<tr>
<td><strong>Liability insurance</strong></td>
<td></td>
</tr>
<tr>
<td>Liability to third parties</td>
<td>Material damage and personal injury caused by an economic entity to third parties</td>
</tr>
<tr>
<td>Responsibility to the economic entity (entities)</td>
<td>Material damage and personal injury caused to an economic entity by a third party during the implementation of an innovative project</td>
</tr>
<tr>
<td><strong>Personal insurance</strong></td>
<td></td>
</tr>
<tr>
<td>Life, health, ability to work</td>
<td>Harm to the life, health, and working capacity of individuals (employees)</td>
</tr>
</tbody>
</table>

**4 Discussion**

In the fuel and energy complex, such digital products are “digital deposit”, “digital mine”, “digital quarry”, “digital supply chain management” and others.

Digitalization in the fuel and energy complex ensures the development of processes:

- Automation of interaction of suppliers, consumers of energy resources, the possibilities of remote use of personal account services for consumers are used.
- Remote control of technological processes (for example, at the facilities of JSC “System Operator EEC”, PJSC “Rosseti”, PJSC “Rushydro”), which seems especially relevant due to the distributed structure of the Russian energy industry, which involves a large number of facilities, technical means, equipment.
- Optimization of human resources by redistributing human resources to other types of work.
- Replacement of digital technologies in technological information systems and corporate automated financial and economic management systems based on imported equipment to achieve import substitution criteria in the field of domestic software by 70% by 2024, which will reduce the likelihood of external threats and technological risks by 80-90%.
- Regulatory regulation of the use of domestic software through a simplified procedure for entering into the registers of relevant ministries without disclosing detailed characteristics in order to achieve energy security.
- Creation of a new digital system of the fuel and energy complex of Russia “National Energy Platform”.

**5 Conclusion**

Summing up, it can be assumed that insurance can become one of the tools to stimulate innovative projects in the field of digitalization of the fuel and energy complex aimed at the
development and modernization of production. We assume that risk insurance in this case will provide:

- Compensation for damage to “production capital”.
- Coverage of “indirect” losses.
- Compensation for the loss of monetary investments.
- Compensation for damage caused by a third party during the implementation of innovative projects.

References


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