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OPERATING ALGORITHM OF THE STRATEGIC CENTRE FOR DIGITAL TECHNOLOGIES IN THE FISHING INDUSTRY

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Abstract. This article considers the technological development in the fishing industry and the use of digital technology in this sector. The study examines the main challenges of digitalization in the economy of the fishing industry, and presents conclusions and recommendations for the implementation of digital technologies. The use of a digital platform, as a system for interaction between independent participants in the economy through an algorithm, in a unified information environment, reduces transaction costs by using digital information processing techniques and optimizing the division of labour. The unique aspect of this digital platform is the feedback from participants, which ensures sustainable development and minimizes risks in a turbulent economic climate. This process ensures the smooth operation of the program and prevents errors. As a result of the research, the authors propose a functional model of a situational centre that reflects the structure and functions of the system, as well as the information flows and material objects that connect these functions.

Keywords: fishing industry, situation centre, information society, process control

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ЦИФРОВЫЕ ТЕХНОЛОГИИ В РЫБНОЙ ПРОМЫШЛЕННОСТИ: АЛГОРИТМ РАБОТЫ СТРАТЕГИЧЕСКОГО ЦЕНТРА

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Аннотация. Данная статья посвящена анализу технологического развития рыбной отрасли. В ходе исследования были рассмотрены основные проблемы цифровизации экономики в отрасли рыбного хозяйства, а также представлены выводы и предложения применения цифровых технологий в рассматриваемой отрасли. Применение цифровой платформы, как системы взаимодействия посредством алгоритма независимых участников отрасли экономики в единой информационной среде, снижает транзакционные издержки за счет использования цифровых технологий обработки информации и оптимизации системы разделения труда. Уникальность цифровой платформы заключается в обратной связи с участниками процесса, в обеспечение устойчивого развития при минимизации рисков развития в турбулентной экономике. Данный процесс не допускает разлаженной работы программы и в дальнейшем предотвращает возникновение ошибок. В результате исследования авторами предложена функциональная модель ситуационного центра, отражающая структуру и функции системы, а также потоки информации и материальные объекты, связывающие эти функции.

Ключевые слова: рыбная отрасль, ситуационный центр, информационное общество, процессное управление

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Introduction

In the context of digital development in the economy, one of the most significant issues is the analysis of fishing and marine industry and the implementation of strategic reforms. This is a relevant issue because the marine industry is a major sector of the economy with access to the world's oceans, and the fishing industry, in particular, plays a critical role in food security.

In addition, it is essential to address the challenge of optimizing processes related to fish extraction, transportation, processing, and distribution to end users. At present, automated, information-based, and digital production processes in Russia fall short of modern standards.

In the fishing industry, there has been little attention paid to the development of digital platforms. However, the advancement of technological and digital technologies has created new demands for advanced training and expertise among specialists involved in production processes at enterprises (Sergeev, 2019). This has led to the generation of innovative engineering solutions and made the innovation process more sustainable.

Today, the concept of a digital economy is a promising research area. Scientists explore digitalization processes in education, sales, medicine, fishing, and agriculture. While most of their

works have a theoretical focus, they do not fully address practical economic challenges and the consequences of digital transformation at a national, regional, or sectoral level.

Materials and Methods

According to "Digital Economy: Pros and Cons of the Network Intelligence Era" by Tapscott D., the term "digital economy" was first coined at the end of the 20th century. The Rosstat experts consider that several factors influence the development of the digital economy:

– The human factor, including the level of education, training, and information literacy of the population;

– Innovative potential;

– Information and communication technologies;

– Economic factors, such as the economic conditions and purchasing power;

– The information industry;

– Information security.

Using modern digital technologies to collect and process information can lead to effective economic growth and improve production and management processes in organizations, as well as their structure and assets.

The process of digitalization plays an important role in all aspects of society, and the government is particularly interested in this. This is the exact reason why Russia has introduced a number of regulations that aim to effectively integrate digital technologies into social and industrial life. One of these is the "Strategy for the Development of the Information Society in the Russian Federation 2017-2030" and the state program "Digital Economy of Russia".

According to the "Strategy for the Development of the Information Society of the Russian Federation for 2017-2030", "digital economy" is defined as "economic activities where digital data makes the key factor of production." Processing and analyzing large amounts of data can significantly improve the efficiency of various types of production, technologies, equipment, storage, sales, and delivery compared to traditional forms of management.

In 1995, American computer scientist Nicholas Negroponte defined digitalization as the process of transitioning from the movement of atoms to the movement of bits.

Some examples of digitalization in the public sector include:

– Digital platforms for interdepartmental communication to facilitate on-time and reliable information transfer;

– Cost reduction and efficiency improvements in government structures;

– Development of digital platforms for the interaction between the state and population;

– Personal digital data (e-IDs have become a platform for voting, banking, access to government services, etc.);

– Digital money (digital currency, electronic payments).

Currently, digital platforms have taken over the whole world and have wide practical applications due to the expanded production of mobile phones, high-speed Internet, digital technologies, in particular artificial intelligence, cloud computing, database processing, etc.

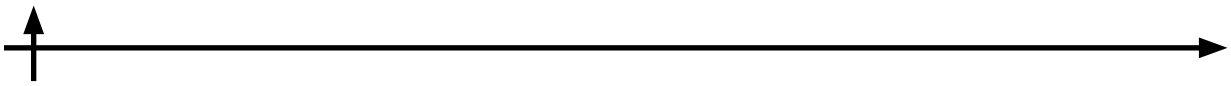
Digital platforms are complex systems that:

– have a hybrid structure that includes a technological design, an ecosystem, and a platform-based business model;

– use an application as the main software;

– experience direct network externalities, where the value of the platform increases as more users join, and indirect externalities, where users of other groups increase the value of their platform;

– provide openness and accessibility to software tools, inputs, and outputs;



– focus on creating value through direct relationships and transactions among stakeholders.

The use of innovative digitalization models contributes to the development of the Russian economy by introducing new forms, methods, techniques, and areas for realizing the economic potential of a business entity in dynamic environments.

Digital innovation is defined as an innovation based on modern information technology, that enables the creation of a computational management process via data collection, processing, analysis, and timely decision-making with regard to various factors. This process allows for the implementation of new methods for organizing and managing businesses, optimizing and reducing costs, and increasing the efficiency of audits.

The process of digital transformation in the fishing industry has not been well considered, as it is based on the use of natural resources and requires large-scale investments. The main challenges of this industry lie in complex socio-economic, environmental, and economic areas with a complicated structure and unpredictable consequences, making it difficult to apply principles, methods, approaches, and models from the digital economy.

Despite this, the fishing industry plays an important role in the country's economy, yet it cannot keep up with technological advancements. The history of technological development in the industry dates back to the 1950s and 1970s, when powerful fleets and processing facilities were developed. Improvements in fishing vessels and the use of synthetic materials have allowed for increased and improved catches in challenging areas. In the 21st century, technologies such as satellite tracking, aviation, and unmanned ships have been introduced.

The use of digital technologies can help control seafood supplies, combat illegal activities effectively, identify new opportunities for fishermen, switch to the digital processing of paper documents on board ships, and ensure efficient and targeted fishing (Davlikanova, 2019; Kudryavtseva, 2021; Mnatsakanyan, 2019; Volkogon, 2019). It can also ensure safety through electronic journals, apply satellite monitoring, and implement international electronic reporting systems.

Reporting is one of the most important tasks of the fishing industry. It involves maintaining ship, technological, and commercial logs, as well as submitting financial and accounting documents. To ensure quick and effective monitoring, this information is sent to regulatory authorities in the form of daily ship reports (SSDs).

The EPJ (Electronic Processing Journal) is a technology that introduces a trade journal using information technology. Its advantages include keeping the fishing log in electronic form, eliminating paper document management, and speeding up data processing.

The interrelation between information from the fishing log and SSD occurs through a GPS receiver that automates the entry of ship coordinates into both the log and the SSD, eliminating data entry errors. The display of the vessel's route in electronic form from the start to the end of the fishing trip helps with the automatic determination of coordinates, monitoring, and data quality control.

The challenges in changing the management system of the fishing industry to meet the demands of a digital economy are linked to the interdependence of activities within the sector, as well as external factors such as environmental, social, and political influences. Due to the specific nature of the fishing industry, which involves long-term operations on large vessels, high costs, and complex technologies, the process of managing the industry is hindered by uncertainty about operating conditions.

To mitigate the associated risks, it is essential to use forecasting techniques for the fishing sector and related industries. Managing the innovative development of the fishing industry necessitates making strategic decisions based on information and communication between different elements of the sector.

Currently, there is a lack of scientific research in the field of innovative development of the digital economy in the fishing industry, which is a significant factor in the successful implementation of digital technology models and methods in practice (Saidova, 2024). The successful implementation of an innovative model can contribute to the development of the fishing industry's economy.

To analyze the industry's innovative activity, statistics and reporting use data on the volume, structure, and dynamics of innovations. The key to innovative development lies in the interdependence between the public and private sectors through digitalization.

The Strategy for the Development of Maritime Activities in the Russian Federation until 2030 considers the problem of developing the country's national maritime activities and the issues related to the development and preservation of the resources of the World Ocean. These problems hinder the development of fishing and fish farming in Russia. To solve these problems and increase the limited maritime potential, the strategy proposes to modernize the fleet and develop the infrastructure of seaports.

Great emphasis is placed on the issue of information support, education, and training of personnel using new technologies (Costa, 2022). However, it should be noted that digitalizing industry processes with outdated technologies will not be effective. Instead, it must be continuously updated with improved technological systems, from catch methods to controlling processing and delivery to the end user. This is not taken into account in the Strategy for the Development of the Fisheries Complex of the Russian Federation until 2030.

Results and Discussion

The conducted research shows that, considering the specific characteristics of fish products in terms of quality, freshness, safety, and nutritional value, as well as current trends in technologies, the following activities are necessary for the future growth of the fishing industry:

1. Implementation of technological modernization in the fishing industry through the introduction of digital platforms that enable effective communication between all stakeholders in the industry;

2. Reduction of waste via product reuse and processing;

3. Control over the entire production process, from capture, processing, transportation, distribution, storage, and delivery to the final consumer, using electronic systems connected to GPS for real-time tracking and information processing (Big Data) (Lee, 2021);

4. Smart and selective fishing methods, such as laser trawling, to increase the reproduction of sustainable fish stocks and reduce the negative impact on the marine environment;

5. Integration of new technologies into existing or new equipment;

6. Automated transportation of fish from trawlers to holds and then from ships to shore using unmanned drones (with the help of a single regional control centre), reducing transactions and costs (Borovkov, 2018; Volkogon, 2019; Merkulov, 2019; Kostrikova, 2019; Maitakov, 2018; Byaletskaya, 2020.).

For the fishing industry, creating a situation centre is a complex task. To solve this problem, it is necessary to create a unified digital platform based on common methods for designing databases, interfaces for participants, and mechanisms for information transmission (Grigoreva, 2025; Jang, 2025).

The use of digital technologies is essential for increasing the efficiency of fisheries. However, it also involves high energy consumption (Millar, 2007). The fishing industry can be a pilot project for the transition to digital platforms.

A digital platform in the fishing industry is a system that allows independent participants to interact through an algorithm in a single information space. It reduces transaction costs by

using digital information processing technologies and optimizes the division of labour. The uniqueness of the platform allows for feedback and ensures sustainable development with minimal risks to economic growth.

For the successful implementation of the platform, it is important to ensure that the software product is not disrupted, as this could lead to errors. Users have the opportunity to benefit from a user-friendly interface and access to a database and reports. In order to analyze the quality of management, it is essential to follow all the rules and algorithms in order to ensure efficient and reliable results (Figure 1).

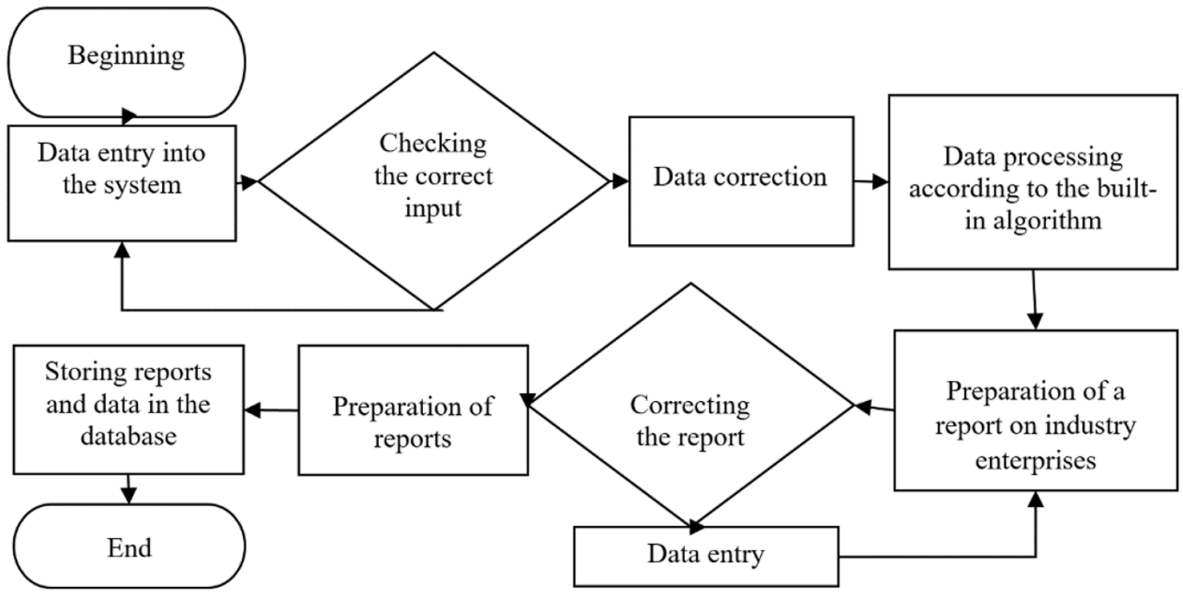


Fig. 1. Data entry and processing algorithm.

The data protection process is divided into several subprocesses at all levels:

1. Control and verification of data entered into the system.
2. Database storage and protection, as well as report generation.

A functional model of the situational centre has been proposed. This model reflects the structure, functions, information flows, and material objects of the system. It also shows how these elements are connected.

The situational centre's functions allow it to perform a basic data processing algorithm that consists of the following steps:

1. Input of data into the system;
2. Calculation of performance indicators based on criteria;
3. Aggregation of indicators to evaluate work quality;
4. Generation of a graph of alternative scenarios for the situation centre;
5. Search for optimal management decisions for the operation of the centre.

The “data representation” function provides the following features: adding, storing, editing, and deleting data.

The “forming estimates of indicators” function implements the process of determining the weights for indicators in order to estimate them.

The “getting an aggregated indicator” function creates a single indicator for the quality of work in the fishing industry by combining the estimates of various criteria.

Building a graph of alternatives implements the analysis of BDD (best-deteriorated-data) and BDR (best-discriminant-ratio) data, creating a graph based on the indicator values and

weights of edges.

Search for Optimal Management Solutions uses the complete selection mechanism on the graph of alternatives, generating a list of management decisions with optimized characteristics.

The computer system of the situational centre includes the following structural and functional components:

– A component for the formation of requirements to determine the main assessment areas;

– A component for building a hierarchical structure based on the types of activities of fishing industry enterprises;

– An information representation component for processing;

– An aggregation component for estimating indicators;

– A management decision-making component based on assessments.

Figure 2 shows the interrelationship between the components of the situational centre.

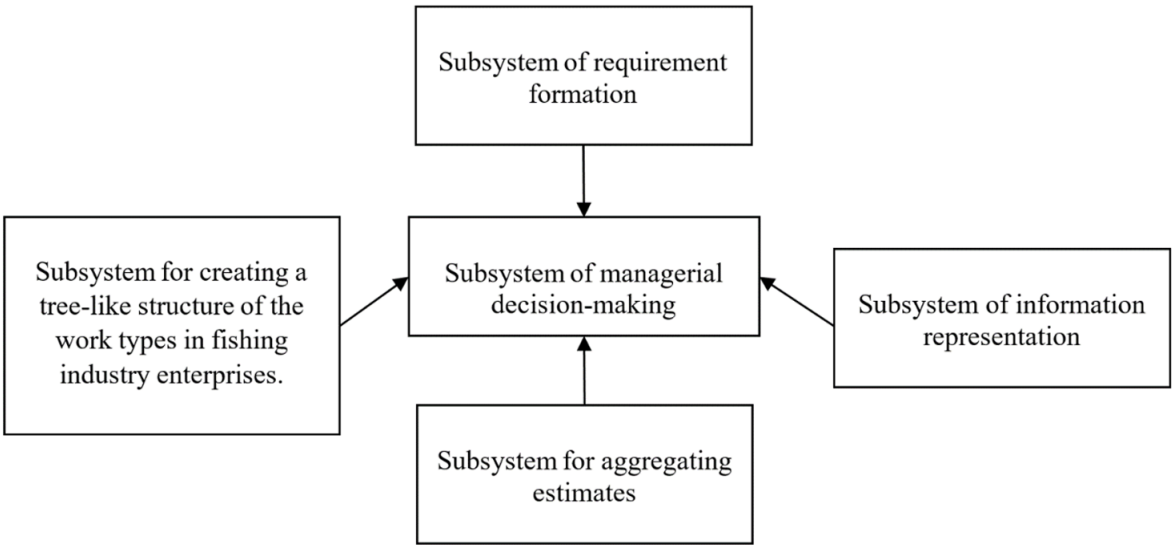


Fig. 2. Interrelation between subsystems of the situational centre.

The use of digital platforms accelerates the automation of the fishing industry, raw material processing, and efficient product distribution.

Conclusion

As a result of this research, the authors:

– explored the digital economy and factors that influence its potential;

– defined the aspects of the Strategy for the Information Society Development in Russia for 2017-2030 and the State Program “Digital Economy”;

– presented the concept of digitalization and its types in the public sector;

– provided a definition, description, and advantages of digital platforms;

– analyzed the technological development of the fishing industry;

– highlighted the main challenges in the rapidly growing sector of the digital economy.

– proposed development solutions for the fishing industry;

– generated a functional model of a situational centre, reflecting the structure and functions of the system, information flows, and material objects connected to these functions.

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