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**INFORMATION SYSTEMS IN RUSSIAN AGRICULTURE
INDUSTRY MANAGEMENT**

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Abstract

The paper focuses on a critical review of modern information systems used by the Russian Federation in the agriculture management, as well as systems useful for industrial economic entities. The urgency of this work is conditioned by the processes of management digitalization, typical for the current stage of the Russian economy development. The purpose of the study was to analyse functionalities of the branch information systems applied in the agri-industrial complex of the Russian Federation, from the point of view of the users' problems solution. The article provides an analysis of the correspondence to the needs of users - government bodies and economic entities. A generalization of the characteristics of information systems used to solve managerial problems of the industry, as well as information systems used to solve managerial problems of a business, is carried out. Methods of system analysis and modeling, ontological modeling, knowledge engineering, and the design methodology of organizational and technical systems were used as research methods. The article concludes with the advantages and disadvantages of information systems used in the industry from the point of view of both categories of users, identifies business needs that are not satisfied by modern information systems and can be satisfied with the industry-specific digital platform. The directions of further research by the authors are given.

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1. Introduction

At the present stage of the world economies development, in anticipation of the Fourth Industrial Revolution, major Western and Asian powers have already taken leading positions in the development and implementation of Industry 4.0 tools. The Russian government also makes strategic decisions in this direction. In particular, "Strategy for the Development of the Information Society in the Russian Federation for 2017-2030" and "Digital Economy of the Russian Federation" Program (Ivanova, Poltarykhin, Szromnik, & Aniehkina, 2019) were developed as long-term planning documents. The program is designed for the time period from 2017 to 2024. Like any program document, it has a "Road Map" with defined goals, objectives, activities and deadlines. Information infrastructure is identified as one of the three key levels of the digital economy. One of its mandatory elements by 2024 will be digital data platforms to meet the needs of citizens, business and government. "The Digital Economy of the Russian Federation Program" (2017) states that by 2024 support will be provided and incentive measures will be implemented to create at least 10 industry-specific digital platforms. As the authors see, one of these sectors should be the agricultural sector. In this regard, at this stage, as of the end of 2019, the authors set the task of researching existing information systems to ensure that they meet the tasks of state regulation and the development of the agricultural business.

2. Problem Statement

The study examines the ability of information systems existing in the Russian digital space to solve current and strategic tasks of the agricultural industry. It also raises the question of the need to create a digital information platform for the agro-industrial complex and of the industry issues that can't be "closed" by the existing information technologies in management.

3. Research Questions

Within the framework of the stated goal, the following objectives will be met:

- the study of modern information systems created by order of state regulatory bodies, and a list of tasks that are solved with their help;
- the study of modern information systems that are used by small and medium-sized agricultural producers in solving their business problems;
- assessment of the strengths and weaknesses of both categories of information systems, exposure of the urgent tasks of business and regulatory bodies that can't be solved by existing information systems.

4. Purpose of the Study

The purpose of the study is to analyze the functionality of industry information systems used in the agricultural sector of the Russian Federation from the point of view of solving user problems. Economic entities of the agri-industrial complex and the government regulatory agencies are designated as users. The research area is limited to information systems aimed at managing the industry and the activities of economic agents.

5. Research Methods

The study proposes the use of the following methods. The systems analysis and modeling, ontological modeling and knowledge engineering were used to analyse the subject area of strategic management of the regional agroindustrial complex development. The systems analysis and modeling, methodology of designing organizational-technical systems are used to set the task of developing an organizational-technical control system.

6. Findings

To date, a certain layer of information systems (IS) has been formed that is used to manage economic processes in agriculture in the Russian Federation. They can be divided into two categories:

- IS which serve as a tool for managing agriculture by public authorities;
- commercial IS used by entrepreneurs working in the agricultural sector.

Both ISs are aimed at solving the problems faced by the corresponding users of this or that category.

6.1. Information systems for solving problems of industry management

The state's goal in the agricultural sector is to promote the effective development of the industry. Moreover, the use of IS is aimed at solving the following management tasks:

- collecting information on the characteristics of management entities (business entities);
- monitoring the activities of management entities;
- receiving feedback from management entities;
- providing business entities with information support for paperwork.

In this regard, modern IS in the agro-industrial complex were created at the initiative of the Ministry of Agriculture; they are aimed at the formation of databases on economic entities and have a minimum of interaction.

In particular, one of such IS is "Information and analytical system of operative monitoring and assessment of the state and risks of scientific and technical support of agricultural development". The IS was created within the Federal Scientific and Technical Program for the Development of Agriculture for 2017-2025, which is aimed at ensuring compliance of scientific and technical potential in the field of agriculture and the possibility of its implementation within the priority of scientific and technological development of the Russian Federation in the agro-industrial complex. Designation of IS:

- collecting information on the implementation of the Program and its individual subprograms, in particular, on the results of the scientific activities of program participants;
- automation of the monitoring process. Monitoring is aimed at identifying significant scientific and technological trends, forming a reasonable alternative assessment of the results obtained and choosing research directions;
- creation of information infrastructure for the expert community in the field of assessment of the current state and risks of scientific and technical agriculture development.

"The Federal State Information System for Accounting and Registration of Tractors, Self-Propelled Machines and Trailers" is being formed on the Technology Portal of Russia's Ministry of Agriculture. Its purpose is to monitor the availability and condition of self-propelled machinery for the program of agricultural development and regulation of agricultural products, raw materials and food markets. The program helps to solve such administrative tasks as: ensuring coordination of activities in the field of state supervision of the technical condition of self-propelled vehicles and other types of equipment in the Russian Federation; ensuring operational interaction and the provision of data at the request of the federal executive authorities in relation to information about registered cars, their technical condition and owners; ensuring the possibility of electronic interaction between the state technical inspection authorities and the Ministry of Agriculture of the Russian Federation in solving the problems of registration of tractors, self-propelled vehicles and trailers for them, as well as between the state technical inspection authorities by requesting information from a single database.

Based on the IC: Enterprise corporate information system, a "System for Monitoring and Forecasting the Food Security of the Russian Federation" is being formed. Its purpose is monitoring and forecasting the food security of the Russian Federation, namely the formation of a database on production, consumption, export-import and prices, as well as formation of current and forecasted food balances of the country and regions.

The functionality for the provision of electronic public services by the Russian Ministry of Agriculture is presented as the Service portal of the Russian Ministry of Agriculture. It contains 43 electronic documents regulating the activities of economic entities in the agricultural sector in six areas:

- livestock breeding (on the procedure for state registration and documentation on determining the types of organizations working in this field);
- crop farming (on the examination procedure for the use of pesticides and agrochemicals and the register of vineyards);
- amelioration (database on availability, certification) (Iticha & Takele, 2019);
- place of origin of goods;
- cooperatives (documenting the creation of agricultural cooperatives);
- generating requests for subsidies.

The automated information system of registries, journals and reference information contains 32 registries providing users with relevant information in all segments of the agricultural business.

The information system for planning and control of the State program is implemented using the "IC: Enterprise" software. The IS is designed to improve the efficiency of management activities, efficiency of the State Program implementation through the use of automated methods for evaluating the results of activities, organization and information support of interaction between departments of the Ministry of Agriculture, executive authorities of the Russian Federation in the planning, implementation, control and analysis of activities and indicators.

A comprehensive information system for collecting and processing accounting and specialized reports of agricultural producers, generating summary reports, monitoring, accounting, control and analysis of subsidies to support the agro-industrial complex (automated information system "Subsidies of the AIC") was implemented on the basis of the "IC: Enterprise" software and aimed at forming a

database on financial performance of economic entities and processing of information within the framework of the subsidy tasks.

The central data analytics platform of the State Information Support System in the field of agriculture is designed for internal use and interaction of subordinate structures of the Russian Ministry of Agriculture. The object of automation within this Analytics Subsystem is activity of the Russian Ministry of Agriculture employees involved in the preparation and adoption of decisions in the field of the agricultural sector of the Russian Federation. This system is able to provide users with "single window" mode of all data available to the Ministry of Agriculture on the state of agro-industrial complex of Russia and foreign markets.

The system contains 124 applications, which include more than 400 analytical sheets on the main objects of agricultural production and separate technological stages: from factors of production to agricultural products and its implementation in foreign markets.

The automated information system "Register of Federal Property of the AIC" is aimed at reporting on the use of state property by institutions subordinate to the Ministry of Agriculture of the Russian Federation.

The Unified Federal Information System on Agricultural Lands is designed to monitor information on agricultural and other land, including information on the location, condition and actual use of such land and the condition of agricultural vegetation.

6.2. Information systems for solving management problems of agricultural producers

In addition to IS, created by the order of public authorities and aimed at solving the tasks of monitoring and forming databases, there is a number of information systems aimed at assisting agricultural producers in achieving their goals.

The goals of sectoral economic entities include the following:

- launching a new small or medium-sized enterprise;
- increasing the efficiency of existing business;
- association into agricultural cooperatives;
- increasing the efficiency of an existing cooperative.

Launching a new business involves such tasks as collecting a set of registration documents for enterprise, forming a package of documents to attract investment (subsidies, loans), organizing production and sales, planning production and sales, etc.

Assistance to the start-up business in solving the above problems is provided by such ISs as the business navigator "Small and Medium Enterprise Corporation", reference IS "Center of Agro Analytics", B2B, B2C services, a number of online stores selling agricultural products.

More than two million users are registered on the Small and Medium Enterprise Corporation website. The Navigator provides business start-up and development services: financial support, access to major customers' purchases, property and legal information, marketing support, e-services and communication with government authorities, local authorities, other bodies and organizations to support small businesses (Chernova, Starostin, Degtereva, & Andronova, 2019). A number of embedded IS is available for business entities operating in the agro-industrial complex:

- information portal "Measures to support agricultural cooperation";
- online catalogue of agricultural products to support sales.

An up-to-date information on prices by sales region can be found on the website of the Center for Agro Analytics. B2B services help to solve marketing issues, for example, to expand the range of potential buyers by posting product information in the catalogue, on the bulletin board. In addition, such IS also provide consulting services, as well as background information useful to the business.

7. Conclusion

The study of the functionality issues and purpose of information systems used by economic entities in the Russian agro-industrial complex allows to draw the following conclusions.

7.1. Advantages and disadvantages of existing information systems in the Russian Federation agricultural management

As each category of IS users has its own goals and objectives, the strengths and weaknesses of the systems have been analyzed from both perspectives. The results are summarized in Table 01.

Table 01. Advantages and disadvantages of sectoral information systems

User	Advantages	Disadvantages
The government regulatory agencies	The systems are used as a tool for data collection, storage, consolidation and systematization, which allows: <ul style="list-style-type: none"> – switch to electronic document management (Il'in, 2017); – create centralized state registers and journals (Kireeva & Carenko, 2017); – bring relevant industry information to the attention of business entities; – generate aggregated reports; – reveal hidden patterns in the social and economic sphere. 	<ul style="list-style-type: none"> – non-compliance with regulations; – automated forecasting tools require updating; – inability to create simulation models to track changes in the situation; – low performance of existing systems and technological limitations do not allow to effectively perform public administration functions (Isaev & Roganov, 2017); – technical limitations, including lack of mobile device capabilities; – difficulty of use by untrained users.
Sectoral economic entities	IS provide full information support for opening a small or medium business in the industry, partial marketing support (information about markets, prices, purchases).	<ul style="list-style-type: none"> – restrictions on request and publication of information and materials by and for users; – lack of a fully functional industry aggregator for business; – marketing functions do not solve industry problems; – IS are aimed at starting a business, not at maintaining and improving its efficiency; – do not take into account the specifics and multitasking of agricultural business; – lack of interactive communication within the IS.

Thus, there is a need to develop a digital business support tool, which would take into account industry specifics and aim at solving management problems of the business (Haberli, Oliveira, & Yanaze,

2017; Nambisan, Wright, & Feldman, 2019; Pereyashkin, 2017; Trivelli, Apicella, Chiarello, Rana, Fantoni, & Tarabella, 2019).

7.2. Questions for Further Research

The next stage of the research will be the formation of a model for managing the region's agricultural complex with the use of digital economy tools (Musina, Yangirov, Nasyrova, & Haritonov, 2019; Musina, Kharitonov, Turganov, & Nizamova, 2019). It will be possible to answer questions about the functionality of the integrator, the architecture of the digital platform, potential customers of the industry's digital platform, potential investors, technological and technical characteristics (Frenken, van Waes, Pelzer, Smink, & van Est, 2019).

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References

- Chernova, V., Starostin, V., Degtereva, E., & Andronova, I. (2019). Study of sector-specific innovation efforts: the case from Russian economy. *Entrepreneurship and sustainability issues*, 7(1), 540-552. [https://doi.org/10.9770/jesi.2019.7.1\(38\)](https://doi.org/10.9770/jesi.2019.7.1(38))
- Frenken, K., van Waes, A., Pelzer, P., Smink, M., & van Est, R. (2019). Safeguarding public interests in the platform economy. *Policy and internet*, 1-26. <https://doi.org/10.1002/poi3.217>
- Haberli, C., Oliveira, T., & Yanaze, M. (2017). Understanding the determinants of adoption of enterprise resource planning (ERP) technology within the agri-food context: the case of the Midwest of Brazil. *International food and agribusiness management review*, 20(5), 729-745. <https://doi.org/10.22434/IFAMR2016.0093>
- Il'in, N. (2017). Evolyuciya informacionnyh sistem gosudarstvennogo upravleniya. [The evolution of public administration information systems]. *Informacionnye vojny*, (1), 54-57. [in Rus.] Retrieved from https://elibrary.ru/download/elibrary_28394427_98831002.pdf
- Isaev, G., & Roganov, A. (2017). Upravlenie kachestvom informacionnyh sistem: identifikaciya paradigmy. [Quality management of information systems: identification of a paradigm]. *Vestnik RGGU. Seriya: Dokumentovedenie i arhivovedenie. Informatika. Zashchita informacii i informacionnaya bezopasnost'*, (2), 61-75. [in Rus.] Retrieved from https://elibrary.ru/download/elibrary_29855156_87140176.pdf
- Iticha, B., & Takele, C. (2019). Digital soil mapping for site-specific management of soils. *Geoderma*, (351), 85-91. <https://doi.org/10.1016/j.geoderma.2019.05.026>
- Ivanova, V., Poltarykhin, A., Szromnik, A., & Aniehkina, O. (2019). Economic policy for country's digitalization: a case study. *Entrepreneurship and sustainability issues*, 7(1), 649-661. [https://doi.org/10.9770/jesi.2019.7.1\(46\)](https://doi.org/10.9770/jesi.2019.7.1(46))
- Kireeva, S., & Carensko, A. (2017). Zemel'no-informacionnye sistemy v sfere upravleniya zemel'nymi resursami municipal'nogo urovnya. [Land information systems in the field of land management at the municipal level]. *Agrarnyj nauchnyj zhurnal*, 8, 11-13. [in Rus.] Retrieved from https://elibrary.ru/download/elibrary_29907363_39179360.pdf
- Musina, D., Yangirov, A., Nasyrova, S., & Haritonov, S. (2019). Metodologicheskaya baza dlya proektirovaniya regional'noj otraslevoj cifrovoj platformy. [Methodological base for the design of a regional industrial digital platform]. *Economics and Management: Scientific and Practical*

- Journal*, 4, 40-43. [in Rus.] Retrieved from https://elibrary.ru/download/elibrary_39163009_12920663.pdf.
- Musina, D., Kharitonov, S., Turganov, A., & Nizamova, G. (2019). Digital Communication Platform for the Agro Industrial Complex. *Advances in Social Science, Education and Humanities Research*, 289, 89-92. <https://doi.org/10.2991/csis-18.2019.18>
- Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. *Research policy*, 48(8), 1-10. <https://doi.org/10.1016/j.respol.2019.03.018>
- Pereyashkin, A. (2017). Proektirovanie informacionnoj sistemy upravleniya. [Designing an information management system]. *Vestnik nauki i tvorchestva*, 3, 106-109. [in Rus.] Retrieved from https://elibrary.ru/download/elibrary_28915444_57699563.pdf
- Programma «Cifrovaya ekonomika Rossijskoj Federacii. (2017). [Program “Digital Economy of the Russian Federation]. [in Rus.] Retrieved from <http://static.government.ru/media/files/9gFM4FHj4PsB79I5v7yLVuPgu4bvR7M0.pdf>
- Trivelli, L., Apicella, A., Chiarello, F., Rana, R., Fantoni, G., & Tarabella, A. (2019). From precision agriculture to Industry 4.0 Unveiling technological connections in the agrifood sector. *British food journal*, 8(121), 1730-1743. <https://doi.org/10.1108/BFJ-11-2018-0747>