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MAIN ASPECTS OF BUILDING A DIGITAL BUSINESS MODEL OF A RUSSIAN AGRICULTURAL ENTERPRISE

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Abstract

The article discusses the work of researchers devoted to various aspects of digitalization, design and creation of digital business models. The analysis of actual data demonstrated Russia's position in the world community in terms of the level of development of digital technologies. An assessment of the depth of digitalization in the sectors of the Russian economy is given and the backlog of agriculture is revealed, inducing the relevance and possibility of rapid and large-scale implementation of IT in this area. A conceptual digital business model of the activity of an agricultural enterprise has been developed, reflecting its business processes and allowing to identify development directions. The practical application of the business model will increase the efficiency of communications and labor productivity through the use of electronic digital communication channels, reduce the transaction costs of the enterprise, which will affect the competitiveness of Russian food products.

Key words**:** *agribusiness, digital business model, Russia*

INTRODUCTION

In modern conditions of global economic development, the level of digitalization of business is a determining factor of successful activity in the market, organization of interaction with suppliers and customers, and, accordingly, the efficiency and competitiveness of the enterprise. Russian agriculture is currently implementing digitalization projects in various industries, which requires the transformation of existing production and economic processes. However, among the types of economic activity, agriculture lags behind the leading industries in terms of digitalization, which leaves ample opportunities for the development of information technology or IT. At the same time, a universal digital business model of an agricultural organization can become the basis for increasing the level of digitalization of the agroindustrial complex (AIC) [5].

To date, the theoretical and methodological foundations of business modeling, digitalization, as well as digital business models of activities, including agroindustrial and agricultural enterprises, are considered in the works of many Russian and world scientists. For the first time, the scientific term "business model" appeared in the 1960s, and gained the greatest popularity at the turn of the XX and XXI centuries [9, 10]. In 2000 J. Linder and S. Cantrell's research turned to the main method of creating consumer value, the essence of which can be revealed through the elements of a business model, an operational model and a model of change [11]. According to the authors, the classical business model can be presented in the form of a static scheme reflecting the current state of the organization, with an incorporated model of changes demonstrating the transformations necessary for the organization in the future to preserve the mass of profits. The key factor of these transformations today is the digitalization of business. A little later H. Chesbrough formulated an expanded definition of the term "business model of the firm", according to which it should be understood as a way of creating value and making profit by the organization [6]. Following him, M. Rozeia and H. Werthner proposed to interpret this concept as a description of the organization's business processes (purchase and sale of goods, profit) [16]. However, the above definitions are very

general, insufficiently specified, and therefore need to be clarified. The attention of the authors is focused on generalization, analysis and use of practical experience of entrepreneurial activity, while management theory is undeservedly ignored. Swiss business analysts A. Osterwalder and Y. Pigneur, considering the business model as a tool reflecting the business logic of the organization and including a system of objects, concepts and their connections, attach dominant importance to the relationship of the enterprise with the external environment, which ultimately determines the level of its competitiveness [15]. At the same time, the authors unreasonably neglect internal factors, the importance of which increases markedly in the conditions of uncertainty of the external environment. In turn, researchers from Brunel University of London proposed their interpretation of the concept of "business model", according to which it should be understood as "an abstract representation of an organization, whether conceptual, textual and/or graphical of all interrelated structural, operational and financial mechanisms developed by the organization, as well as all products and/or services which the organization offers on the basis of these mechanisms, which are necessary to achieve strategic goals and objectives" [13]. Summarizing the scientists who study the concept of a business model, it can be noted that most of the author's definitions combine not a functional, but a process approach to management and the inclusion in the structure of the model of influencing factors that contribute to the creation of key values for customers, ensuring the competitiveness of firms, mainly due to external factors.

Regarding the definition of a digital business model, the authors' opinions are much more differentiated and diverse. In particular, S. Shen, A. Basist and A. Howard interpret the digital model through the prism of digital agriculture as an aggregated combination of digital databases (climatic, landscape, soil, etc.) that ensure the adoption of more competent management, production and marketing decisions [18]. N. Venkatraman and J. Henderson understands the digital business model as a digital strategy demonstrating the construction of a virtual organization according to three priority vectors: interaction with customers, asset configuration and the use of knowledge [19]. Osterwalder also believes that a digital business model is a conceptual tool that contains a set of digital elements and their relationships and allows you to express the business logic of a particular firm. It is a digital representation of the value that a company offers to one or more customer segments, as well as the technological architecture of the firm and its network of partners to create, market and deliver this capital of value relationships to generate profitable and sustainable revenue streams [15]. V.I. Medennikov in his works defines the agroindustrial complex business model as a transformed digital database model within a specific digital platform [12]. A.A. Ilyina and A.A. Kudryashov propose an interpretation of the digital business model in the agroindustrial complex as a digital platform model that takes into account the structure of the AIC of the region and promotes the active introduction of advanced information technologies in activities of small and medium-sized agricultural producers [7]. At the same time, it can be noted that, despite the large number of publications, there are still difficulties regarding the use of a single terminology of these two concepts ("digitalization" and "business model"), since the category "digital business model" has not yet been clearly formulated.

In order to increase the level of digitalization of the agroindustrial complex of Russia, it is necessary to develop a concept of a digital business model for the activities of an agricultural organization. This conceptual digital business model of an agricultural enterprise should be a strategic management tool used for the purpose of demonstrative presentation of business processes to determine promising business development options [3, 14]. The application of the model in the practical activities of agricultural organizations will contribute to increasing the level of interaction of all participants in business processes in real time based on the

use of electronic and digital communication channels that provide them with equal access to data arrays and their reliability. The final result of building activities based on the digital business model will be the acceleration of the efficiency of decision-making and production and economic processes, entailing a reduction in transaction costs and a corresponding increase in the efficiency and competitiveness of agricultural organizations.

MATERIALS AND METHODS

In preparing the article, data from the Ministries of Economic Development, Agriculture, Science and Higher Education of the Russian Federation, the Federal State Statistics Service of Russia, information from higher educational institutions and scientific institutes at the federal and regional levels, the works of Russian and world economic scientists on the formation of business models and digitalization of various sectors of the economy, materials from research organizations of various countries of the world. When studying the theoretical and methodological foundations of various organizational and economic aspects of digitalization of enterprises, monographic and logical methods were used. The study of the current state of digitalization of business processes was conducted on the basis of statistical, economic and comparative analysis. The directions of digitalization of agricultural organizations' activities were determined using abstract-logical and computational-constructive methods.

RESULTS AND DISCUSSIONS

The analysis of the indicators of the level of digitalization of various sectors of the economy demonstrates that today Russia is at an average level in the development of digital technologies in the world, ahead of some developed countries in some indicators. Today, due to the growing awareness of the importance of digitalization at both the public and private levels, the processes of digitalization of all sectors of the Russian economy have intensified, specialized departments are being created, IT companies are being opened, targeted programs are being implemented, including in agriculture. According to the Higher School of Economics (HSE), Russia's gross domestic expenditures on the development of digitalization in the period 2017–2019 increased from 3.6 to 3.7% of Gross Domestic Product (GDP), amounting to 63.34 billion US dollars. At the same time, during the same time, the internal costs of Russian organizations for the creation, distribution and use of digital technologies and related products and services increased from 1.9 to 2.2% of GDP, amounting to $38.62 billion [1]. At the same time, the costs of Russian households for the use of digital technologies and related products and services increased from 1.3 to 1.5% of GDP, amounting to $24.71 billion.

In the structure of the total costs of Russian enterprises for the creation, distribution and use of digital technologies and related products, the largest share, naturally, is made up of information and communication organizations. Among the leaders are also: professional, scientific and technical activities, financial, insurance and educational organizations (Table 1). Agriculture, along with cultural and sports organizations, is in the outsiders, which may indicate a large reserve for the growth of digitalization of these industries.

According to the business digitalization index, Russia (32) occupies an average position (for example, for Romania this value is 27, and for Finland it is 52). Along with the expansion of the use of information technologies, the understanding of the need to protect information and technological infrastructure is also growing. The leaders in the use of antiviruses in Russia are providers, followed by IT companies, processing and energy sectors by a small margin (Table 2). Most often electronic signatures are used by the energy and processing sectors, as well as IT companies. Tools that prevent unauthorized access, as well as spam filters, intrusion detection systems and system security analysis tools are widely used in the communication and IT spheres. Meanwhile, in the matter of information encryption, these

two industries have reversed places. At the same time, it should be noted that, in general, the use of various means in the business sector is not equivalent. Thus, antiviruses and electronic signatures are the most common, followed in descending order by: authorization tools, antispam, encryption, intrusion detection tools and security controls. At the same time, the latter are 2 times less popular than, for example, encryption.

Table 1. Structure of internal costs of Russian organizations for the creation, distribution and use of digital technologies and related products and services by type of economic activity in 2019

Branches of the economy	**Structure, %**
Information and communication	21.6
Professional, scientific and technical activities	19.7
Financial and insurance activities	15.5
Education	12.0
Manufacturing industry	7.2
Wholesale and retail trade	6.1
Public administration, social security	3.6
Transportation and storage	3.2
Real estate transactions	2.4
Healthcare	1.6
Energy supply	1.6
Construction	1.3
Mining	1.1
Culture and sports	0.6
Agriculture	0.6
Other	1.9
Total	**100,0**

Source: Compiled by the authors according to the HSE [1].

Table 2. The use of information security tools in organizations of various sectors of the Russian economy in 2019 (share in the total number of organizations, %)

Types of activities	Business Digitalization Index	Regularly updated antivirus programs	Means of digital electronic signature	Software and hardware that prevent unauthorized access of malware	Spam filter	Encryption tools	Computer or network intrusion detection systems	Software tools for automating the processes of analysis and control of the security of computer systems
Business sector, total (average)	**32.2**	**79.0**	**73.4**	**61.0**	**56.2**	**43.8**	**43.4**	**35.5**
Mining	29.4	78.8	70.5	65.2	59.5	45.8	43.7	35.9
Manufacturing industry	35.8	83.7	83.6	68.0	61.0	51.4	46.8	34.1
Energy supply	30.2	83.5	84.6	64.8	54.2	50.0	41.5	34.2
Water supply, sanitation, organization of waste collection and disposal	24.9	68.1	80.7	37.1	30.6	31.4	22.6	20.8
Construction	25.3	69.6	69.3	49.9	45.0	35.5	35.7	27.6
Wholesale and retail trade	39.2	82.1	61.4	69.4	69.0	43.4	52.5	44.0
Transportation and storage	29.3	82.1	77.8	64.1	54.9	48.2	45.6	36.0
Activities of hotels and catering establishments	34.1	71.9	76.4	50.3	48.8	36.1	35.8	30.6
Telecommunications	44.5	91.4	78.2	81.0	74.2	66.0	64.5	61.5
Information technology industry	35.6	87.8	83.3	76.0	69.6	67.8	59.8	50.1
Real estate transactions	23.8	67.1	78.2	43.7	38.3	34.2	28.6	23.7
Professional, scientific and technical activities	26.6	75.4	77.9	54.4	48.8	42.3	36.6	29.0

Source: Compiled by the authors according to the HSE [1].

Thus, it can be noted that the Russian economy is actively implementing digital technologies in all spheres of production and economic activity [8, 4]. At the same time, the

agroindustrial complex and agriculture are still in the rearguard of these trends, which leaves a large field of activity for the implementation of IT projects and requires measures to develop digitalization. In order to support these initiatives, the concept of a digital business model for the activities of an agricultural organization at the regional level of Russia is proposed within the framework of this study.

The presented conceptual digital business model of the agricultural organization's activities in the region was based on a business model template developed by Alexander Osterwalder and Yves Pigneur. This template was presented in the work "Building business models. The Strategist and Innovator's Handbook" is currently widely and actively used by companies of various levels (from startups to multinational corporations).

The process of digitalization of agribusiness induces the need to reconstruct the applied business model by replacing its central element. This process is accelerated by the following factors:

– advantages of digital technologies (a significant increase in the scale of the market, which does not involve significant capital investments, reduction of transaction costs, increase in the speed of service);

– diffusion of digital solutions into the daily lives of customers, turning them into an immanent component of any activity;

– "digital maneuvers" of competing enterprises, inspiring other market participants to IT evolution.

The use of platform business models creates the possibility of continuous interaction of all participants in business processes in real time based on the use of electronic and digital communication channels that provide them with equal access to data arrays and their reliability. As a result, the probability of unfair competition is significantly reduced.

Within the framework of the developed business model, two groups of factors are identified that sequester the opportunities for increasing the competitiveness of an agricultural enterprise. The first group is related to the manufactured product and includes: 1) resources, 2) partners, and 3) actions. The second group characterizes the market: 1) values, 2) consumers (target groups, customer relationship technologies), 2) results. In addition, the model reflects the main financial indicators of the organization's activities: expenses and income, integrally demonstrating its financial efficiency.

The developed conceptual business model of an agricultural enterprise is a strategic management tool used for the purpose of a spectacular presentation of business processes and the subsequent search for "bottlenecks", identification of potential growth points and promising business development scenarios. Within the framework of this business model, the organization's activity is considered as a dynamic process in which two main parts are distinguished: the left – "input" (or expenses) and the right – "output" (or income). The transition from one part to another (from the past to the future of the organization, from expenses to income) is carried out through the introduction of IT technologies.

The proposed business model is a closed-loop model in which the starting point is $Capital_0$ and the end point is $Capital_1$, but in the future $Capital_1$ becomes the basis for the next cycle. In addition, in the model, the agricultural organization is considered not in isolation, but in direct contact and mutual influence with the external environment.

The global structure of the business model is determined by a logical chain of questions facing any enterprise: "How? → What? → Why?". At the same time, each question corresponds to a specific answer: "Product → Market → Finance". The question "How?" refers to the way of creating a product, "What?" – the value of this product for the consumer, "Why?" – the purpose of the enterprise (Profit). The cycle of the model, considered in a different sequence, solves the problems of the development of society: starting from the Problem that generates demand in the market, an agricultural organization offers its solution (Product), while consuming Finance and creating Value in the course of its activities.

The first block is the resources that make up the capital of an agricultural organization.

This block accumulates the most important assets necessary for the functioning of the business model. These assets determine the eventuality of the creation and delivery of value propositions by an agricultural enterprise to the consumer, its entry into the market, the formation of strong ties with consumer segments and as a consequence, making a profit.

Key resources can be classified as follows:

- natural (land, climate, terrain, water);
- innovative (applied technologies, product quality control systems, experience in implementing innovative projects);
- production (physical objects such as buildings, equipment, vehicles, production facilities, points of sale and distribution networks);
- intellectual (intellectual property objects, in particular, trademarks, secret information protected by property rights, know-how, patents, licenses and copyrights, partner and customer bases, organizational structure and management structure of the enterprise);
- investment (cash, credit lines or reserve fund funds; can be converted into any other type of resources);
- communication (various options for collaboration with other enterprises to launch new startups and implement business projects);
- social (availability of managerial personnel, specialists with the necessary qualifications, experience and age);
- information (arrays of data and information products, for example, programs).

It is important to note that IT technologies have had a significant impact on the business model block under consideration. In particular, the intellectualization of business dictates increased requirements for the competencies of employees, who must now possess relevant knowledge in the field of Big Data, Data Science, mathematics, analytics, robotics and skills to work with digital devices. As a result, it is necessary to solve the problem of attracting and retaining highly qualified IT specialists in agriculture. All graduates of universities specialists in the field of information technology are in high demand in the market, most of them are employed in the process of training. However, unfortunately, they do not consider the agricultural sector of the economy to be a promising area of application of professional competencies acquired during their studies. Personnel "hunger" is today the most important obstacle to the introduction of modern digital solutions in agricultural enterprises, because without experience with digital technologies it is impossible to fully use the software product, comprehensively revealing its potential, and, therefore, to obtain the expected economic effect.

The second block is the main partners. This block clearly demonstrates the network of partners who ensure the effective functioning of the business model. Building partnerships with an agricultural organization is inspired by its desire to achieve the following goals:

– cost reduction (rational use of both own and attracted resources);

– risk reduction (joint activities in the development, implementation and promotion of individual projects);

– aggregation of resources and differentiation of functions (organizations often do not have the entire set of resources necessary for the implementation of activities or are unable to perform the entire set of actions independently).

The introduction of digital technologies provides additional benefits from cooperation with partners, for example, reducing the transaction costs of interaction between subjects of market relations by significantly accelerating the communications of platform users and eliminating intermediaries.

The third block is the types of activities of an agricultural enterprise that determine the effectiveness of its functioning. Intelligent solutions are also reflected in this block of the business model. Activities related to the use of digital technologies and platform solutions come to the fore [17]. An important role in the transformation of this block is played by personnel, as well as cooperation, integration and clustering [2].

The fourth block is digital technologies. The basis of the conceptual digital business model of an agricultural organization is made up of digital technologies that are being

implemented or are already actively used in the industry:

- big data (in agriculture, we constantly have to work with big data, and therefore this end-to-end technology of their distributed processing has been widely used in the AIC business platform);
- artificial intelligence algorithms (artificial intelligence systems that perform the functions of tractor drivers, combine harvesters, etc., will be used in agriculture in the foreseeable future);
- blockchain (these technologies are used for maintaining distributed databases on land purchase and lease transactions, solving other tasks);
- mobile platforms (used to fully automate the processes of monitoring the state of soil, crops, the environment, vehicles, agricultural machinery for precision farming, obtaining consulting services on meteorological conditions, monitoring the condition of domestic and wild animals, automating the processes of storage and processing of agricultural products, etc.);
- Internet of things (communication technologies and information transmission over the Internet directly between equipment and machinery are already widely used, the scale of this process will only expand);
- geo-positioning (used for creating and maintaining land and water cadastres, developing a digital terrain model, measuring fields, monitoring meteorological conditions, monitoring agrotechnical operations and the condition of crops, planning and analyzing the use of agricultural machinery, assessing the amount of damage and compensation payments in emergency situations, etc.);
- wireless communication (these technologies are of particular importance in agriculture, characterized by the territorial separation of infrastructure and production units);
- unmanned transport (used for creating electronic maps of fields in 3D format, analyzing the state of the soil, planting seeds, calculating the normalized vegetation index for the purpose of effective fertilization of crops, monitoring the state of the crop and its processing, inventory of agricultural work, protection of land, etc.);
- augmented reality (an example is the ItorumMR application, which involves the use of augmented reality glasses in order to train employees to manage complex equipment, agricultural machinery and transport, conduct work rationing and remote production audit);
- robotics, sensors (sensors and robotic systems are used in the agricultural sector to perform standard repetitive operations and replace a number of working professions);
- cloud computing (used in the process of collecting, consolidating and analyzing data in agriculture).

The fifth block is value propositions. Digitalization has brought to this block the possibility of using IT technologies to digitize analog products, an example of which is the equipping of agricultural machinery with navigation systems and fuel consumption sensors in order to save resources and reduce downtime.

The sixth block is consumer segments, sales channels and customer relationship technologies. This structural block identifies potential buyers of agricultural products, ways of interacting with consumer segments and communicating value propositions to them. In order to maximize customer satisfaction, it is advisable to aggregate them into groups. At the same time, classification features can be, for example, their needs, gender characteristics, behavioral characteristics, income levels, sales channels through which interaction with them is carried out. Differences in needs determine the differentiation of supply. The presented model covers one or more consumer segments. Strategically important for the organization is the decision on the design and sequestration of the serviced segments. This will allow us to construct a business model based on a clear understanding of the specific needs of customers of selected segments. At the same time, it is important to note that the digital transformation of business is undoubtedly also reflected in this block of the business model. The pattern of consumer behavior under the influence of digital technologies is undergoing significant changes. The Internet has become

the main channel for informing them (advertising in search engines, social networks, mobile applications and web sites, e-mail of the enterprise).

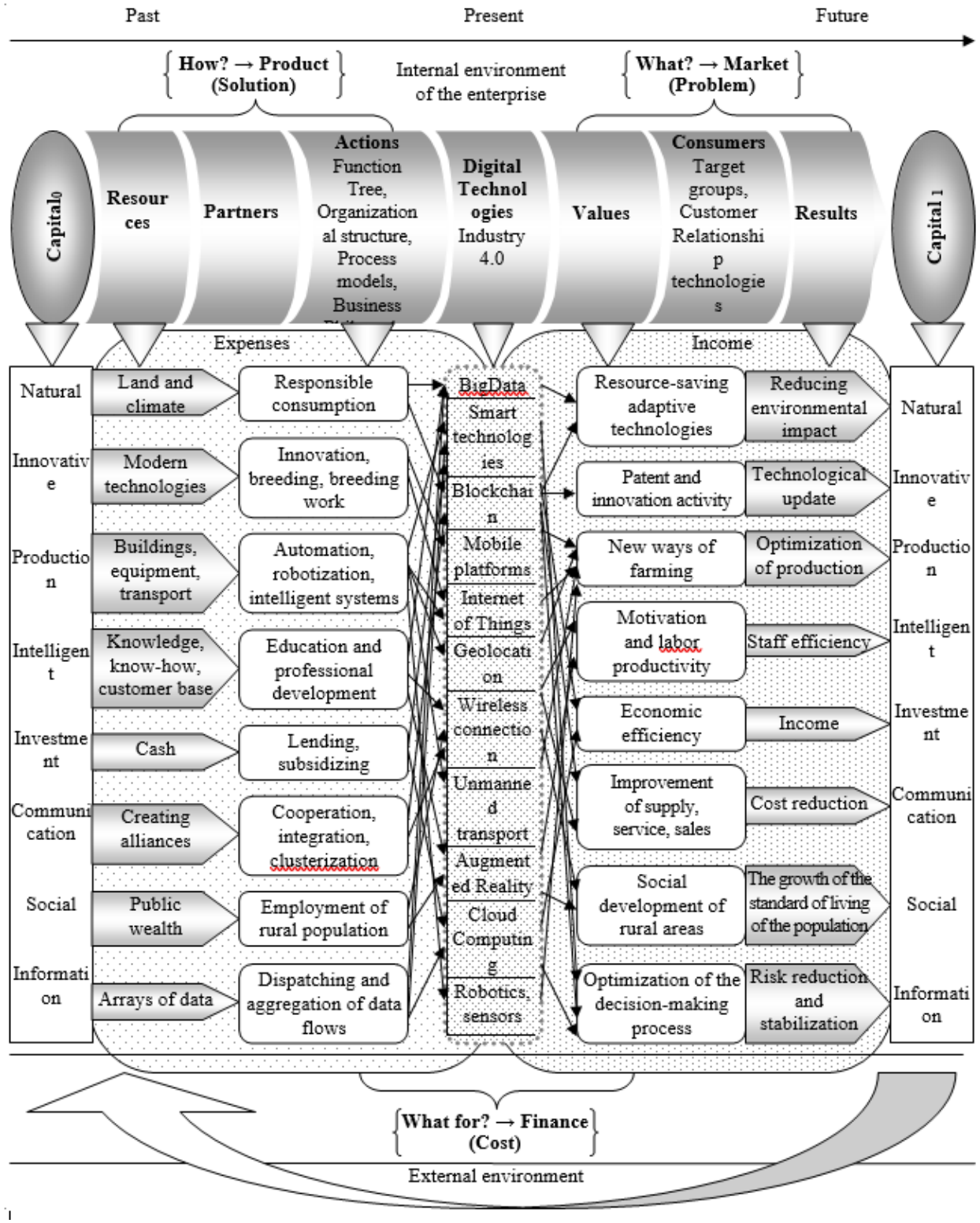

Fig. 1. Conceptual digital business model of an agricultural organization
Source: Compiled by the authors.

Consumers want to be able to purchase products online as well. Approaches to the study of consumer preferences have also changed – it is becoming popular to map the user path by tracking digital points of contact of the consumer with the organization in order

to enter new consumer segments and increase consumer loyalty.

The seventh block is the results obtained as a result of the use of digital technologies in an agricultural organization (reduction of anthropogenic load, introduction of innovative production and management technologies, cost reduction, professional development of workers and labor productivity, growth of welfare and improvement of the quality of life of the rural population, minimization of enterprise risks).

The concept of a digital business model presented in Figure 1 is a theoretical construction that assumes practical filling with specific production and economic elements.

The implementation of the organization of agricultural enterprises in the Russian regions on the basis of the presented digital business model will accelerate the introduction of information technologies and bring the agricultural sector to the level of other sectors of the national economy.

CONCLUSIONS

Over the past decades, many aspects of the introduction of information technologies in various sectors of the world economy have been sufficiently studied and theoretical and methodological foundations for the digitalization of enterprises have been formed. Currently, scientists around the world continue to work on studying and improving the mechanism of digitalization of many areas of agriculture, exploring the role of science and obstacles in the development of digital agriculture, new management methods in the context of digitalization, the interaction of government and business in digital transformation and digitalization as a tool to overcome the consequences of the pandemic. In addition, specific digitalization tools are considered: the creation of a single digital platform, the introduction of artificial intelligence elements (fuzzy logic, neural networks, pattern recognition), cloud and unmanned systems, digital grain platforms, monitoring and feedback. At the same time, large-scale studies are being conducted on the issues of training specialists in the field of digital agriculture and digitalization of educational processes.

These initiatives are being actively implemented in practice. Currently, digitalization processes of various branches of the Russian agroindustrial complex are underway everywhere, projects for the development of information technology are being developed and implemented. However, the level of use of information technologies in agriculture today is still significantly lower than the average for the sectors of the economy. The main application of IT is reduced to the use of computers and general-purpose software for communication, accounting and reporting. Few agricultural enterprises use digital technologies to monitor the condition of fields, crops and animals. At the same time, one of the obstacles to the widespread spread of IT in agriculture is the shortage of qualified personnel, the main reason for which is the low attractiveness of work in rural areas.

Thus, it is necessary to establish effective cooperation of IT developers (innovative companies) with the management of large industrial enterprises in the process of forming a register of relevant digital proposals in order to adjust the development programs of the Russian AIC in accordance with the needs of enterprises. In addition, it is advisable to regularly monitor the needs of the regional economy in specialized companies that develop and implement digital technologies. The implementation of a unified digital model of agricultural organizations' activities will allow us to comprehensively solve the tasks set. The implementation of these measures will eventually allow attracting the necessary number of enterprises to the agricultural sector of the Russian regions for the development, implementation and operation of digital production and management systems. The development of digitalization of all spheres of activity of agricultural enterprises will create prerequisites for increasing efficiency and competitiveness in the international market of Russian agricultural and food products.

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