Conceptual Approaches to Implementing the Digital Supply Chain Management in Some Areas of the Russian Economy

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***Abstract*— Recently, digital, information and telecommunications resources have become widespread in Russia, and the processes of supply chain in various spheres of society are being actively digitized after the covid-19 spread. As of today, there is a successful experience in the development and subsequent use of various electronic platforms, systems and services, such as SIS of HCS (in the field of housing and communal services), UMIAS (healthcare), Public Services (provision of public services), UIS (procurement), etc. The existence of such software products affects effectively the performance of functions by public authorities, allows optimizing the work, and also provides access to the necessary information. Based on this, we can say that digital technologies cover most areas of the country's life. However, these areas of activity are usually not related to production. This situation is developing not only in Russia, but also in the global economy as a whole. It is easy to implement digital technologies in the service sector. This is largely due to low-cost investments that pay off quickly and make services more affordable. This is not the case with production, where the introduction of digital technologies will require changing the technology or even the organizational mechanism of production functioning. Moreover, it does not depend on which sector of the economy will be affected by the introduction of digital supply chain management (DSCM). The tasks of digital technologies in production should be a significant increase in labor productivity, the use of modern technologies that allow competing in the world market of goods. In addition, digital technologies in the manufacturing sector of the economy are designed to facilitate production management, correct management decisions, and obtaining detailed, necessary information about production processes.**

***Keywords*—** *Digital supply chain management, digital transformations, financial resources, personnel of the digital economy.*

1. Introduction

It is impossible to deny that digital technologies have fundamentally changed consumer behaviour, company activities and the relationships between all elements of the economy, in other words, it has totally influenced the supply chain process. In order to reduce the lag in labor productivity, crop productivity and other indicators from countries with traditionally developed agriculture, in Russia more and more attention is being paid to the development of state support measures to stimulate the development of digital technologies in the agro-industrial complex [1-3]. The traditional supply chain characterized by physical flows that move products and information from one end of the supply chain to the other [4] is often visualized as a rigid arrangement of supply chain partners that handle however, such measures have not produced the desired results over the past 3 years. This is despite a number of adopted legal documents in this area. Here are some of them:

1. Decree of the President of the Russian Federation No. 350 of July 21, 2016 "On measures to implement the state scientific and technical policy in the interests of agricultural development".
2. Decree of the Government of the Russian Federation of March 7, 2008 No. 157 "On creating a system of state information support for agriculture".
3. Order of the Government of the Russian Federation of March 3, 2012 No. 297-r "On approval of the Principles of the state policy for the use of the land fund of the Russian Federation for 2012-2020".
4. Order of the Government of the Russian Federation of July 30, 2010 No. 1292-r "On approval of the Concept for the development of state monitoring of agricultural land and land used or provided for farming as part of other categories of land, and the formation of state information resources on these lands for the period up to 2020".
5. Order of the Government of the Russian Federation of June 29, 2016 No. 1364-r "Strategy for improving

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the quality of food products until 2030".
6. Federal law No. 101-FZ of July 16, 1998 "On state regulation of ensuring the fertility of agricultural land".
7. Federal law No. 101-FZ of July 24, 2002 "On the turnover of agricultural land".
Currently, the Federal State Information System FSIS "Seed Production" has been developed to meet agricultural needs in the field of seed production and agricultural plants. At the same time, to solve all the problems and issues of the agro-industrial complex, one narrowly focused service is not enough. It is necessary to cover not only seed production and selection, but also crop production, animal husbandry, processing and other sub-sectors of the agro-industrial complex. In this case, digitalization will be systematic and effective [5-12].

2. Materials and methods

2.1 Supply Chain Digitalization

A digital supply chain is a smart, value-driven, efficient process to generate new forms of revenue and business value for organizations and leverage new approaches with novel technological and analytical methods. DSC is not about whether goods and services are digital or physical; it is about how supply chain processes are managed with a wide variety of innovative technologies, e.g. unmanned aerial vehicles, cloud computing, and Internet of Things, among others [4]. In supply chain optimization, a wide range of instruments of varying complexity and costs are employed, for instance, software products for efficient supply chain design, providing systemic integration, such as SAP, Oracle etc. Supply chain management traditionally applies scenario and simulation modelling, operations research, production and inventory control. The paper uses system, comparative, economic and mathematical, and other research methods. Published works of research and higher educational institutions of the Russian Academy of Sciences, analytical materials of international organizations, and statistical materials at the federal and regional levels were used as materials.

3. Results

In this paper we intend to develop a conceptual framework that describes the relationship amongst supply chain digitalization, supply chain capabilities and operational performance. The Ministry of Agriculture of Russia has recently proposed a departmental project "Digital agriculture", which provides a set of measures for the introduction of digital technologies and platform solutions in the agro-industrial complex. This project involves the creation and development of the national platform for digital public management of agriculture "Digital agriculture", the module "Agricultural Solutions", and the industrial electronic educational environment "Land of knowledge". In addition to creating these software products, the project involves simultaneous work on training specialists of agricultural enterprises in order to form their competencies in the field of DSCM. Together, these services accumulate the entire array of information about production processes in the field of agriculture, starting with the smallest details of production and ending with solutions to global issues of the entire agricultural sector. This will bring agriculture to a new level of development and make it possible to make a technological breakthrough in the agro-industrial complex [13-16].
Free and open access to information resources will optimize the production processes; will significantly reduce costs for enterprises, which should lead to higher production both in volumes of raw materials, products and indicators of financial and economic activities. However, this requires significant government support, as well as creating motivation and incentives for organizations in the agricultural sector of the economy to use modern digital technologies in production.
The platform "Digital supply chain" should work and provide a system of access to information about the counterparty, and this, in turn, will allow checking enterprises quickly when solving serious issues, such as financing organizations, lending, and insurance. It is impossible not to pay attention to the planned automation of some production processes, carried out using modern computing technologies and fixing systems by installing various electronic and intelligent sensors and other digitization tools. The platform will allow controlling the quantity of received product, its quality, processing process, movement and other operations remotely. This project also involves active interaction with other Federal Executive authorities and their services, which will allow collecting more information and updating it in a timely manner. With established communication the platform, as a single information space of agriculture, will undertake the task of planning and forecasting of production activities, which will enable early identification of issues that are preventing or "inhibiting" processes for the development of agriculture, and also to develop measures to solve these problems promptly. Of course,

we cannot do without the expert support of the scientific community – specialized research institutes and working groups on these issues.

The approach considered in this paper to implement the national platform for digital supply chain management of agriculture "Agricultural DSCM" has the following goals:

1. DSCM of agriculture through the introduction of digital technologies and platform solutions to ensure a technological breakthrough in the agro-industrial complex and achieve productivity growth in "digital" agricultural enterprises by 2 times by 2024.
2. Improving the effectiveness of state support measures in terms of stimulating the digitalization of the agro-industrial complex economy by identifying and analyzing point problems and conditions that hinder the development of digital technologies in the agro-industrial complex of the studied subject of the Russian Federation, as well as identifying the main and most promising DSCM from the perspective of agricultural producers.
3. Interdepartmental interaction for transmitting data on agricultural land to the digital platform "DSCM agriculture" for subsequent accounting, monitoring, and analytics.
4. Stepwise regulation of the implementation of the departmental project "Digital agriculture".
5. Creation of a system for training specialists of agricultural enterprises in order to develop their digital SCM competencies in working with digital products and digital technologies.

The goals of the program include 7 indicators that characterize the development of the digital economy in this sector of the economy. It is assumed that by 2024, data on the main resources (agricultural land, working and productive livestock and agricultural machinery) used in agriculture will be digitized by 100%. Of course, this can only be viewed on the positive side. However, this will require incentives for organizations to use digital technologies, as well as government support.

It is also assumed that in 2020, labor productivity in agriculture, due to the introduction of digital technologies, will increase by 25% (table 1). This is a fairly optimistic forecast, taking into account that the share of investment in digital economy tools will not exceed 25% by 2024. And this is not to mention 2020, when the volume of investment in digital SCM tools does not exceed 3%. As world practice shows, initial investment of 30-40% of GDP is necessary for such a growth in labor productivity. This is one of the significant risks of this program. To solve this problem, it is necessary to create favorable conditions for investment, and therefore for production. By 2023, it is planned to introduce digital technologies in all regions of Russia, while the share of material costs in the cost price will decrease to 43-45%, which is also a very skeptical value and rather characterizes a certain risk of failure to meet this indicator. Rather, we can talk about eliminating losses, accuracy of forecasts, and introducing the latest biotechnologies, but not about digital technologies. At the same time, the costs associated with the operation of digital technologies, their maintenance or payment for their use may increase in the cost structure.

Table 1 – Indicators of digital transformation of agriculture

Indicators	Base value (2018)	Years				
		2020	2021	2022	2023	2024
Share of data on agricultural resource objects (agricultural land, working and productive livestock, agricultural machinery) included in the digital platform "Digital agriculture", %:						
agricultural land (from the total area of agricultural land)	35	75	90	100	100	100
working and productive livestock (from the total number of livestock in this category)	0	35	50	75	90	100
Agricultural machinery (from the total number of units)	25	60	75	90	100	100
Coefficient of labor productivity growth in agricultural enterprises, %	-	125	150	175	190	200
Share of investment in the purchase and implementation of digital products and technologies (including the purchase and implementation of digital products and technologies of domestic production) (from the total investment volume of agricultural enterprises),%	0,5 (0,1)	3 (1,5)	7 (5)	10 (7)	15 (10)	25 (20)

Percentage of contracts concluded (in electronic form) with grantees (of the total number of grants),%	-	25	50	75	100	100
Share of Russian regions that have implemented digital sectoral planning of agricultural production based on the digital platform “Digital agriculture”,%	-	6	29	59	100	100
Share of material costs in the cost of a unit of agricultural production (fuel, fertilizers, electricity, planting material, feed, etc.), % (of the cost)	65	55	50	47	45	43
Share of specialists of agricultural enterprises who have undergone retraining and have competence in the field of digital economy to work with digital products and technologies, % (from the total number of specialists employed in agricultural enterprises, cumulative total)	-	15	20	30	40	50

As it can be seen from table 1, the goal of the departmental project “Digital agriculture” is the digital transformation of agriculture through the introduction of digital technologies and platform solutions to ensure a technological breakthrough in the agricultural sector and achieve productivity growth in agricultural enterprises using digital technologies by 2 times by 2024. To achieve such a significant goal, we need tools that allow identifying problems that hinder the development of digital technologies, determine the most priority areas of state support (including ranking them by importance) in the field of digitalization of the agro-industrial complex, and assessing the effectiveness of implemented measures to make appropriate adjustments promptly and reliably; and most importantly, creating favorable business conditions and incentives for the introduction of digital technologies. In modern conditions, the existing level of knowledge and technology of agricultural enterprises, as well as support from the state, is not enough for the development of digitalization in agriculture.

At the moment, Russia has set course for digitalization of society. The Digital agriculture project is aimed at creating a unified national digital platform in the agro-industrial complex, which will lead to the complete digitalization of agriculture and will bring benefits both to the state and agricultural organizations. This course involves three stages.

The first stage is the creation and implementation of the national platform for digital public management of agriculture “Digital agriculture”. This digital platform will be integrated with other components of this digital platform for managing agriculture at the regional and municipal levels, which will allow agricultural organizations to receive state support through a common, unified national digital platform. This will require organizing the work properly and, above all, developing the concept of digital agriculture, collecting the necessary information and interacting with other authorities and organizations. To ensure subsequent accounting, monitoring, and analytics through digital agriculture, it is necessary to work out in detail the regulations for transmitting data on agricultural land. As an example of involvement of regions in the implementation of a departmental project, we can name the Novosibirsk region, Krasnodar and Altai territories. Established interaction between the authorities will allow getting up-to-date information about agricultural land and land used or provided for farming as part of other categories of land. The collected information will help solve a number of issues, including understanding the need to create integrated products for agricultural producers that allow optimal selection of a combination of state support measures. In addition, it will require the development and adoption of appropriate legal acts.

The second stage involves the creation and implementation of the module “Agricultural Solutions” - the national platform for digital state management of agriculture “Digital agriculture” to improve the efficiency of agricultural producers. The logical result of this module is to increase labor productivity by 2 times, as well as reduce the costs of agricultural enterprises. The implementation of integrated digital solutions will ensure the productivity and efficiency of using this module. For proper implementation of the second stage, it is necessary to develop technical and substantive requirements taking into account the real needs of agricultural producers.

The third stage is based on the creation of a system of continuous training of specialists of agricultural enterprises in order to form their competencies in the field of digital SCM. The center of competence

"Digital agriculture" with agencies on the basis of agricultural universities of the Ministry of Agriculture of the Russian Federation and other agricultural organizations will implement training and retraining programs for specialists of agricultural enterprises to master the competencies of the digital SCM.

The problem of training and retraining of personnel working in the field of agriculture has been long overdue, because the introduction of new digital technologies is actively entering our lives, but their application sometimes faces difficulties.

There are approximately 1.6 million digital technology specialists in the Russian digital SCM. Most of them are concentrated in those activities where the highest wages are paid. This is understandable, because experts in this field are usually young people who are focused on making money. Out of 1.6 million people, 32.6% are employed in information and communications, 14.2% in manufacturing, 6.0% in public administration, 2.8% in education, and 2.7% in healthcare. And only 0.4% of specialists work in agriculture, forestry and fisheries. The table shows that the higher the average monthly salary, the higher the percentage of ICT professionals. Therefore, the salary of these specialists is the main factor determining their share in each of the areas of the economy. The exceptions are such types of economic activities as mining, financial and insurance activities.

In addition, the global demand for these specialists is quite high. It should be noted that only 0.4% of specialists in the field of information and communication technologies are concentrated in agriculture, with an average salary of 28.7 thousand rubles (table 2). Thus, the personnel problem is one of the risks of introducing digital technologies in agriculture and a number of other sectors of the economy, such as housing, health, education, etc. For comparison, in the developed countries of the world, the salary of specialists in the field of digital technologies exceeds 100 thousand dollars per year.

In 2017, the number of graduates of bachelors, specialists and masters in the main specialties of information and communication technologies (ICT) amounted to 54,994 people or 5.7% of all graduates. In addition, in 2017, 31043 mid-level specialists in the field of ICT were graduated, which accounted for 6.1% of the output of specialists from secondary special educational institutions.

Table 2 – ICT specialists by type of economic activity and level of remuneration, 2018

Type of economic activity	Percentage of ICT professionals	Average monthly salary, rubles
Information and connection	32,6	66590
including telecommunications	9,7	No data
Information technology industry	16,1	No data
Manufacturing industry	14,2	40722
Professional, scientific and technical activities	7,4	66264
Transportation and storage	6,2	47474
Public administration and military security, social security	6,0	47803
Wholesale and retail trade	5,4	35444
Financial and insurance activities	5,3	91070
Education	2,8	34361
Healthcare and social services	2,7	40027
Construction	2,4	38518
Energy provision	2,2	47482
Administrative activities and related additional services	1,8	31706
Activities in the field of culture and sports, leisure and entertainment	1,3	44439
Mining	1,3	83178
Real estate transactions	0,8	33101
Hotels and catering establishments	0,5	26241
Water supply, sanitation, waste disposal	0,4	31586
Agriculture, forestry, hunting, fishing and fish farming	0,4	28699

The proposed industrial electronic educational environment "Land of knowledge" will allow obtaining remotely knowledge for the use of digital technologies in general and exchange experience among students. Thus, the process of implementing the departmental project "Digital agriculture" requires working out a clear stepwise development plan, which will reflect the real mechanisms for its implementation and needs. Moreover, in the near future, it is necessary to study the technical side of this issue. Unified software

and other technical components are required. The project needs support and maintenance from the state in the form of subsidies, the development of a regulatory framework, and the creation of conditions for training specialists.

In total, about 140 billion rubles are planned to be spent on digital transformations in agro-industrial production (table 3), of which about 50% are Federal funds and funds from non-budgetary sources. This ratio raises certain concerns. As a rule, state support with such a ratio between budget and non-budget sources of funding is doomed to failure. Therefore, such risks should be taken into account when forming the legal framework for digital transformation and the organizational mechanism for obtaining state support. The organizational mechanism of state support should be transparent and encourage the introduction of digital technologies.

Table 3 – State support for digital transformations in the agricultural sector of the economy, billion rubles

	Years					Total
	2020	2021	2022	2023	2024	
Federal budget	26,0	29,0	35,0	23,0	22,9	135,9
Budgets of subjects of the Russian Federation	0,5	1,0	2,2	2,0	2,0	7,7
Non-budgetary sources	7,0	15,0	22,0	35,0	56,0	135
Total	33,5	45,0	59 ,2	60,0	80, 9	138,5

Digital transformation is supposed to be implemented through four main activities (which consist of separate sub-measures). The first event – "Creation and implementation of the national platform for digital state management of agriculture "Digital agriculture" is the main event, on which it is planned to spend 108 billion rubles over the next 5 years (table 4).

Table 4 – Financing of digital transformation measures, billion rubles

	Years					Total
	2020	2021	2022	2023	2024	
Creating and implementing a national platform of digital state management of agriculture "Digital agriculture"	20,2	23,8	28,1	17,1	18,8	108
Creation and implementation of the module "Agricultural Solutions" of the national platform for digital state management of agriculture "Digital agriculture" to improve the efficiency of agricultural organizations	3,0	3,8	5,5	4,6	2,7	19,6
Creation of a system of continuous training of specialists of agricultural enterprises in order to form their competence in the field of digital SCM	1,9	0,5	0,4	0,4	0,4	3,6
Implementation of the departmental project "Digital agriculture"	1,0	1,0	1,0	1,0	1,0	5,0

The essence of this event is to create a global Federal platform that reflects the state of digital enterprises. All agricultural organizations using digital technologies will be included in this platform. The second event is the creation and implementation of the module "Agricultural Solutions" of the national platform for digital state management of agriculture "Digital agriculture" to improve the efficiency of agricultural organizations. This module is aimed at improving the efficiency of management in the agro-industrial complex. It is planned to spend about 20 billion rubles. The event related to the introduction of digital technologies in agro-industrial production comes next in terms of funding. It is planned to spend 5 billion rubles. It is planned to spend 3.6 billion rubles on training and retraining of personnel for the digital economy in the agricultural sector. This is about 13 million rubles on average for one agricultural university in Russia, which is catastrophically small.

4. Conclusions

The paper describes the main approaches to implementing digital SCM in the agricultural sector of the economy, as well as creating the competitiveness of the Russian agro-industrial complex.

As recommendations for implementation in practice it is necessary to pay attention to the need to implement the following actions:

- to eliminate the risks associated with the ratio of funding from budgetary and extra budgetary sources using the example of previous experience;
- to pay attention to the state of human resources potential and its payment involved in the digital SCM of the economy, regardless of the industry;
- to develop a transparent mechanism of state support that motivates the use of digital SCMs;
- to develop and adopt necessary legal regulations that regulate digital SCM in the economy and create

favorable economic conditions for investment in the digital SCM.

They cannot allow delays in the development and adoption of legal acts that affect the regulation and legislative consolidation of digital transformation, as well as acts that provide subsidies for agricultural producers, due to the large number of Federal Executive bodies involved and complex lengthy procedures for approving the provision of subsidies. Thus, having solved the identified problems, state authorities will receive an effective mechanism for implementing state policy in terms of stimulating the digitalization of agricultural producers and agricultural producers will receive stimulating and necessary support.

The implementation of the departmental project "Digital agriculture" will allow implementing the digital SCM of agriculture through the introduction of digital technologies and platform solutions to ensure a technological breakthrough in the agro-industrial complex and achieve productivity growth in "DSCM" agricultural enterprises by 2 times by 2024.

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