



02.06.2021

LAPPEENRANTA-LAHTI UNIVERSITY OF TECHNOLOGY LUT
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Degree Programme in Industrial Engineering and Management

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Digital supply chain as a development strategy for the company

Master's Thesis

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ABSTRACT

Author: Aisylu Iskhakova Title: Digital supply chain as a development strategy for the company
Year: 2021 Place: Lappeenranta
Master's thesis. Lappeenranta-Lahti University of Technology, Industrial engineering and management 99 pages, 18 figures, 27 tables and 3 appendices Supervisor: Professor Leonid Chechurin
Keywords: Digital, supply chain, innovation, strategy, Russia, logistics, manufacturing, agricultural, industry, economy, enterprise
<p>The goal of this dissertation is to examine a new digital supply chain as a result of modifications within the framework of principles economy and Industry 4.0. The majority of these transformations are the effect of intermediate goods needing to integrate rapidly, supply chain participants having to make shipments accessing tracking and visibility operations, and getting fast information and having communications. Besides the digital economy and SCM transitions, the impact of new developments and IT on the supply chain of the agricultural industry is analyzed.</p> <p>For the thesis' hypothesis, this analysis consists of a using qualitative and quantitative methods, including relevant firms and specialists from agricultural complexes. The methodological analysis contained the observation of the companies' (milk production leaders) activities and data analysis using standard statistical methods.</p> <p>The carried-out study resulted in identifying strategic alternatives, which are backed by the methodology used along with observational studies performed: The company is moving away from the need to make a choice between differentiation and cost and offers a differentiated product, while reducing costs relative to competitors. Thus, strategic alternatives will help bridge the gap between the company's high strategic goals and its current development as a part of the transition to the digital economy. The presented strategic alternatives in this work are generalized to manufacturing company and should be used as a way to improve the efficiency of the digital supply chain that are acceptable for the relevant organization, sector, and form of business.</p> <p>A few of the enterprises related to the study were interested in dealing with the suggested improvements in logistics operations. The findings of this study can be used to introduce new ways of the supply chain in agricultural processing firms by further improving their market share.</p>

TIIVISTELMÄ

Tekijä: Aisylu Iskhakova Työn nimi: Digitaalinen toimitusketju yrityksen kehitysstrategiana
Vuosi: 2021 Paikka: Lappeenranta
Diplomityö. Lappeenrannan-Lahden teknillinen yliopisto LUT, Tuotantotalous 99 sivua, 18 kuvaa, 27 taulukkoa ja 3 liitettä Tarkastaja: professori Leonid Chechurin
Hakusanat: Digitaalinen, toimitusketju, innovaatio, strategia, Venäjä, logistiikka, valmistus, maatalous, teollisuus, talous, yritys
<p>Tämän tutkielman tarkoituksena on tutkia uutta digitaalista toimitusketjua, jonka mahdollistavat muuttuneet periaatteet taloudessa ja teollisuus 4.0 käyttöönotto. Suurin osa näistä muutoksista johtuu puolivalmisteiden integroinnista nopeasti; logistiikkakumppaneiden on toimitettava toimituksia seuranta- ja näkyvyysfunktioiden avulla; ja tieto- ja viestintätekniikan käyttö. Digitaalisen talouden ja SCM-muutosten lisäksi analysoidaan maatalousalan, innovaatioiden ja teknologian toimitusketjun nykyisten suuntausten vaikutusta valmistavaan yritykseen.</p> <p>Tämä tutkimus tehtiin kvalitatiivisella lähestymistavalla, johon osallistuvat asianomaiset yritykset ja asiantuntijat, molemmat maatalouskompleksit. Empiiriseen tutkimukseen sisältyi yritysten (maitotuotannon johtajien) toiminnan havainnointi ja data-analyysi tavanomaisilla tilastomenetelmillä.</p> <p>Toteutetun tutkimuksen tuloksena löydettiin strategiset vaihtoehdot, joita tukevat käytetty teoria sekä suoritettu empiirinen tutkimus: yritys on siirtymässä pois tarpeesta valita eriyttämisen ja kustannusten välillä, ja se tarjoaa erilaistuneen tuotteen samalla kun se vähentää kustannuksia verrattuna kilpailijoihin. Siksi strategiset vaihtoehdot auttavat ylittämään kuilun yhtiön korkeiden strategisten tavoitteiden ja sen nykyisen kehityksen välillä osana siirtymistä digitaalitalouteen. Tässä työssä esitetyt strategiset vaihtoehdot on yleistetty valmistaville yrityksille, ja niitä tulisi käyttää keinona parantaa digitaalisen toimitusketjun tehokkuutta, joka sopii kyseisen yrityksen, toimialan ja liiketoimintatyyppin ainutlaatuiseseen kontekstiin.</p> <p>Muutama tutkimukseen liittyvä yritys oli kiinnostunut käsittelemään ehdotettuja parannuksia logistiikkatoiminnoissa. Tämän tutkimuksen tuloksia voidaan käyttää tuomaan uusia tapoja toimitusketjuun maatalouden jalostusyrityksissä, parantamalla edelleen näiden markkinaosuutta.</p>

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1. Introduction

Today, the position of the Russian Federation's agro-industrial complexes is extremely difficult to describe as a steadily developing direction of the country's economy. The modern circumstances for the agricultural complex to work, like other industries, affect the difficult situation even in the framework of the provision of benefits by the government of the country. If earlier economic issues were the main problems in the agribusiness growth, today they manifest themselves through sanctions pressure, exacerbation of internal market competition, increased tax burden as well as unprofitable agribusiness and dependence of agribusiness enterprises on state support.

Nevertheless, modern trends in agriculture have significantly influenced the system of functioning of the company and the division, respectively, since now completely new, theoretically proven strategies based on logistics concepts are being created and implemented. It is the results of the implementation of these concepts that will make it possible to obtain the effect of mutual influence, especially such integration as the production and logistics activities of the company, which will subsequently affect the growth of the company's financial results.

The stable and fast functioning of the enterprise's logistics, as a rule, is one of the most important criteria, which guarantees the receipt of goods of the required quality and in the required quantity in right location and in time for the end consumer (Ivanov et al., 2019). Undoubtedly, the general development strategy of the company and logistics activities are interdependent, and can also determine the dynamics of financial results both within the enterprise and at the level of the regions of the country. The experience of foreign companies in the implementation of logistics activities allows us to conclude that there are a huge number of effective approaches to its application as well as concepts that have led to a significant change in the priorities and market conditions in relation to the reconstruction of the production process based on logistics.

As a result, the question arises about the effectiveness of the mutual influence of logistics activities on the overall development strategy of the company. In the continuous struggle for a buyer, organizations are trying to combine production and trading networks into one common system with the aim of rational organization of material flows, commodity circulation as well as reducing additional costs. The main task of supply chain management is to ensure the continuous movement of objects of work and the continuous employment of jobs. Just for this, there is an urgent need to create an organizational and economic apparatus and the use of means with which it is possible to organize control on each supply chain with using a digital logistics. In addition, this effect will primarily be reflected in the

process of organizing the distribution of goods in a production unit, where the task of logistics is to make the process of coordinating material flows fundamental for all structural units. This kind of integration will make it possible to achieve maximum rationalization of the product distribution process in manufacturing companies focused on warehousing and packaging.

In addition, the interaction of logistics and production activities will affect such intra-production sub-processes as purchasing, warehousing, maintenance and support of the production facilities, transportation, inter-divisional information and product sales. All elements of integration must be mutually coordinated with each other, which means that the activities of the enterprise in the field of production will be optimized and efficient.

The thesis aims to study how the digitalization of the supply chain of an agricultural enterprise in Russia differs from the digitalization of enterprises in any other industry. Based on this, work describes:

- definition of digitalization of the supply chain in the broad sense of the word;
- identification of the best practices for the digitalization of SC in the agroindustry;
- analysis of the main indicators of the agro-industrial complex work based on an interview with an employer and a survey;
- defining the role of dairy production in the system functioning of the agro-industrial complex;
- proof of the application of these practices on the example of a company that produces milk - JSC "Krasnyi Vostok Agro";
- consideration of the economic characteristics of JSC "Krasnyi Vostok Agro";
- results of the digitalization plan within the JSC "Krasnyi Vostok Agro".

The study of the infrastructure of JSC "Krasnyi Vostok Agro" in the dissertation work allows to formulate the main directions of enhancing of agribusiness, providing for the optimization of the ways of movement of material flows.

1.1 Background

The focus of this master's thesis is to examine the modern digital supply chain that has been created by economic changes and the rapid growth of IT. The onset of the coronavirus outbreak has intensified the digital transformation of the supply chain that has been languishing on the 'to-do' list of companies for years. Covid- 19 has revealed obstacles to cooperation that are accepted under normal conditions by most businesses.

Today, because of closed borders and limitations on international transport, companies are facing a lot of problems. Those who can have a stronghold on their shipment's location at any given time achieve a competitive advantage. When a company is able to locate precisely, where a shipment is being held and how long it will take to arrive, whether it is delayed or routed, they achieve the highest degree of flexibility. Option to use sources like AI and blockchain, creating an immutable data trail will enhance business and customer trust in the quantity and quality of products manufactured, shipped, and distributed, as well as the carbon emissions associated with those products in the supply chain (Ghoreishi and Happonen, 2020). Consumers often want to know that their goods have a COVID-19-free custody chain, ensuring that when moving through the supply chain, they have not been infected with the virus.

Overall, the introduction of new technology provides the supply chain process with additional transparency and confidence, exposing the availability and protection of products, thus speeding up their distribution. These mentioned changes aim to capture most of the value chain as well as to assess the advantages of implementing DSC within the framework company's development strategy. As a result of this growth, the industry can expand the market due to using completely new digital logistics instruments, and the goal of this study is to identify, assess, and potentially find a few strategic alternatives of DSC.

The JSC "Krasnyi Vostok Agro" offered to identify new strategic alternatives of DSC for assessing the changes in development strategy. Besides the literature review, this thesis includes an exploratory evaluation of companies in Russia's agricultural industry as well as the potential for utilizing new digital economy sources.

1.2 Research gap

There have also been a variety of reports on the DSC impact of changes in a company's development strategy. However, the number of articles written on the digitalization of the supply chain of an agro-industrial enterprise is almost zero. Even then, the objective of this research is to draw on them and explore different ways to utilize the digital supply chain that are allowed by the mentioned improvements and that can be applied in the sense of the agrobusiness.

The literature review showed that only 2% of the 44367 (total number of articles) are written on the digitalization of the supply chain of an agro-industrial enterprise.

Since the study's scope is limited to discovering, testing, and measuring experimental tools of digital supply chain, testing their viability would have to be the focus of potential analysis in work.

1.3 Research questions

To construct the study and convert the suggested aims and field of a review into explicitly defined priorities, two research questions were developed. The first research question this thesis seeks to address is:

Q1. Is digitalization of the agro-industrial enterprise's supply chain necessary?

The thesis is built on the first research question, which is then expanded upon. When the present effects on the financial position and development strategy of the chosen company is clarified and evaluated, the strategic alternatives of using DSC can be recognized. There have been lots of changes in recent times, the point of view is also focused on the future potential effects of the changes. The second research question, which is as follows, describes another aim for this analysis:

Q2. If digitalization is necessary, how can it be implemented?

As well as the strategic alternatives of DSC have been identified and evaluated using the value chain and instruments of the modern economy, the role of emerging technologies, innovation, and strategies in understanding found alternatives can be investigated. Research question also helps to find a connection between the theoretical part and reality. It is important because the aim of this analysis is to identify necessity to implement DSC that can be applied in the real-world market climate of Russian agri-complexes.

As previously mentioned, both of the above study questions provides methods for identifying and assessing the subject and its outcomes. That structure was selected to form a sequence of gradual steps that will take the study from the general theory stage of changing the supply chain management to the field of DSC and its new principles, and eventually, to the real-life setting in the order to discover something meaningful and implementable here. As a warning, it's necessary to highlight that the study at hand necessitates making quick choices to execute it, which may result in not being valid in a

real-life context in the modern world. Even so, in this situation, the findings should be used as a base for further study, to scope and execute the path, as well as to decide where it is not useful to go.

The following are the goals of our comprehensive literature review, based on the explicit study questions:

- gaining a better understanding of what is currently understood in the field of current studies on:
 - a) about supply chain system of companies and their experiences;
 - b) about using the information technologies for optimization logistics system of the company;
- gathering, analyzing, and summing up the results of previous research in order to assess the present state of study literature;
- identifying difficulty points and gaps in the published literature;
- designing related literature for further analysis within our current issue;
- concentrating and enhancing our study tasks.

1.4 Scope of the research

Despite the fact that the aim of this study is to look into the effects of DSC on a company's development strategy, the focus will be on agriculture logistics. Fortunately, a few discussions and some primary details from the CEO of an agricultural company were able to be gathered, diversifying the sources and growing the study's degree of reliability. However, the study concerns also other Russian companies in this industry.

The theoretical basis of the final qualifying work will be the works in the field of agroindustry through various scientific articles and journals. In addition, work includes conducting interviews with specialists in the field of organizing logistics within an agro-industrial complex and interpreting their opinions.

Delimitation of the theory and literature applied within the framework of the following points:

- the theoretical basis of the supply chain system;
- the essence of logistics activities at the enterprise;
- features of the mutual influence of information technology and logistics activities at the enterprise;
- determining the role of the digital supply chain system in the implementation of modern enterprises;
- key theories of digital economy's impact on logistics;
- the methods used during the work in the field of research;
- logistics management in the company;
- definition of the most important DSC's metrics.

Delimitation of the empirical part applied within the framework of the following points:

- the research will use statistical data from the Federal State Statistics Service and the financial statements of "Krasnyi Vostok Agro";
- definition of directions for SC digitalization in JSC "Krasnyi Vostok Agro";
- economic characteristics of JSC "Krasnyi Vostok Agro";
- analysis of the main indicators of production and logistics activities of JSC "Krasnyi Vostok Agro";
- results of the digitalization plan within the JSC "Krasnyi Vostok Agro".

1.5 Structure of the thesis

By preserving the same scope of the task, this thesis' structure follows the rationale of the existing research questions. The research moves from the theoretical to the Russian macroeconomic context, then to the business and organization level to determine the analytical study's findings. The theoretical component of the research is fairly general, but the objective is to limit and concentrate the reach of the research throughout the process, thereby presenting specific conclusions for the viewer that can be backed up and justified by the research's previous sections. The following is the thesis's structure:

1. Introduction
2. Literature review
3. Analyze the agroindustry in Russia

4. The research's implications
5. Identified and assessed new strategic alternatives
6. Discussion
7. Conclusions and further studies

The final section includes the suggestions for future analysis, which are focused on the nature and shortcomings of this research, and even the empirical research findings. As a summary of the findings of this study proposing possible new strategic alternatives for applying DSC in a selected organization, prospective analysis should involve evaluating the outcomes of businesses implementing the alternatives.

2. Digital Supply Chain

Analyzed a lot of foreign research manuscripts. So, there are some review articles related to the chosen topic. Most of them are published in 2018-2020. As a result, it was decided to make a research project on that relevant theme nowadays. As a result of this, the question arises of the effectiveness of the mutual influence of production activities on logistics. In a continuous struggle for the buyer, organizations are trying to combine production and distribution networks in one common system in order to rationally organize material flows, product distribution as well as to reduce expenses.

The key role of digital logistics is to guarantee production processes (product with the necessary quality on time) and to ensure the continuous movement of objects of labor and the continuous employment of jobs. In definition, it is not enough to have quality and time aspects right, but also place and cost level should be competitive. Just for this, there is an urgent need to create an organizational and economic apparatus and use the means by which it is possible to organize control at each stage of production on the basis of logistics. As a rule, this effect will primarily affect the process of organizing the product distribution of the production unit, where the task of logistics is to ensure that the coordination of material flows becomes fundamental for all structural units. This kind of integration will allow to achieve the maximum rationalization of the process of goods distribution in production companies oriented to warehouse storage and packaging.

Logistics by definition concerns physical material flows, information flows, monetary flows and recycling flows. In some common definitions SCM is logistics, which is just in strategic level. It is so important, that these need to be taken into account in all strategies that company is involved in. It involves an aggressive reorganization of the supply-side functions of the company in order to optimize customer satisfaction and achieve a sustainable competitive advantage. Luckily, effective elements of SC and digitalization are increasing that can drastically boost end-to-end supply chain visibility and foster even more resilience in the SC. Advantages of automation the SCM are increasing financial results and efficiency in information processing, high availability (information is repeated in each node such that if the device crashes, the data is not lost), ease of B2B communications, creative inventory monitoring, and visibility system. By using blockchain, IoT, IoB, AI, robotics, QR, and RFID technology, the reader can observe the components across the supply system, including smart contracts, openness, no need for middlemen, automation, and global accessibility.

The stable functioning of the enterprise's production, as a rule, is one of the most important criteria. Now production and logistics activities are interdependent, and can also determine

the dynamics of financial results both within the enterprise and at the level of the country's regions. The experience of foreign companies in the implementation of logistics activities allows us to conclude that there are a huge number of effective approaches to its application as well as concepts that led to a significant change in priorities and market conditions in relation to the reconstruction of the production process based on logistics.

In addition, the interaction of logistics and production activities will affect such intra-production subprocesses as procurement, warehousing, maintenance and support of the production workshop, transportation, interdivisional information and marketing of products. All integration elements must be mutually agreed upon, which means that the enterprise's activities in the field of production will be optimized and being efficient.

This research can help the company of agroindustry to use the scheme of implementing digital supply chain on its own experiences. As a result, the application of these analysis methods will integrate logistics and production as efficiently as possible, as well as organize the movement of material flows in the company, minimize the cost of manufacturing finished products. This is achievable because of:

- 1) rationalization of stocks. This issue requires a binding solution, since the use of warehouses as well as the material and technical base, accounts for most of the costs;
- 2) minimization of losses. All logistics processes involve probable losses; however, their improvement and rationalization will allow achieving minimal losses in production;
- 3) exclusion of injuries. The use of logistics in production activities automatically meets all labor safety requirements;
- 4) lack of need for auxiliary workers;
- 5) optimization of production and storage facilities.

There was found already existing research works, which were studied on the topic of "Digital supply chain as a development strategy of the company" due to working on the research project. The starting material was sources such as Scopus, Elsevier, Springerlink, Wiley-Blackwell, Jstor. Supply chain AND Digital OR information technology OR electronic AND Strategy AND enterprise became the keywords for the search and 15 relevant articles on this topic were identified through the use of the statistics on systematic literature review protocol as can be seen in Table 1.

Table 1. Statistics on systematic literature review protocol

Database	Keywords used	Search in (abstract, full text, keywords or else)	Time interval	Number of hits	Number of relevant
Elsevier	"supply chain" AND Digital OR "information technology"OR electronic AND Strategy AND enterprise Supply chain	Abstract, title,key words In title	2018-2020	40	4
Scopus	"supply chain" AND Digital OR "information technology" OR electronic AND Strategy AND enterprise	Abstract, title,key words	2000-2020	16	3
Springerlink	"supply chain" AND Digital OR "information technology" OR electronic AND Strategy AND enterprise	Abstract, title,key words	2000-2020	7	0
Wiley- Blackwell	"supply chain" AND Digital OR "information technology"OR electronic AND Strategy AND enterprise	Abstract, title,key words	2018-2020	28	3
Jstor	"supply chain" AND Digital OR "information technology"OR electronic AND Strategy AND enterprise	Abstract, title,key words	2000-2020	247	5
Total:				338	15

One part of papers studies includes theory and experiences of supply chain of companies. Other part of papers investigates the development strategies of companies. And the third part of the research reflects one of the most popular theme nowadays – Digitalization.

Providing the main results of the literature review by the following Figure 1.

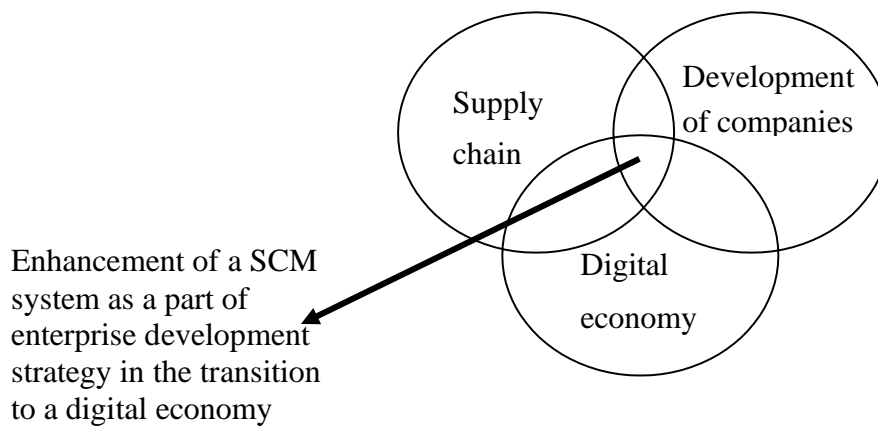


Figure 1. Field mapping

As a result, three topics are connected to each other and show the reader the main idea of the research work. Innovation will always move forward, and corporations will learn creative ways of applying innovative solutions to problems. As well as new possibilities arise and current facilities change, DSC roadmaps must be agile and develop regularly. Nowadays new technological propulsion systems are becoming heritage innovations. In order to benefit of constantly evolving resources, enterprises must always keep an optimistic attitude for workflow and technological advancement for sure they can change their own best strategies halfway along. As well as all organizations are at their own technological development level, shifting forward as founders of the digital age or leading the way from current tech-savvy companies, maintained focus on key competencies is essential. Sure precisely what organization would like to accomplish and how to get all benefits from digital operations will make the managers and CEOs visualize their perspectives and gain the objectives, while promoting operational effectiveness and technology advancements.

The technique created in 2007 by Newbert S.L. (Newbert, 2007) for his study in resource-based viewpoint of company inspired the methodology of the systematic literature review. Newbert's step-by-step structured literature review approach is the most effective for dealing with a vast volume of very relevant and largely unrelated literature. Regarding the modification of the method for the objectives of my own present research, the principles, and steps for conducting a literature quest are as follows: Table 2 demonstrates the number of articles returned from the methodology used at each step from 5.a. through 8.

Total result of the relevant articles by dint of using keywords in 7 databases gave 338 papers. After elimination of 11 papers, which were found not relevant by reading their full texts at steps 6, final number of relevant papers of the systematic literature search became 15.

Table 2. Number of research papers reviewed during the systematic literature review methodology

Database	Step 5a	Step 5b	Step 5 c	Step 5 d	Step 6	Step 7	Step 8. Final
Elsevier	15117	150	45	40	7	4	4
Scopus	9416	421	59	16	5	3	3
Springerlink	314716	13411	6727	7	5	0	0
Wiley-Blackwell	1032	145	141	28	4	3	3
Jstor	4255	1667	598	247	5	5	5
Total:	344536	15794	7570	338	26	15	15

While Scopus, Elsevier, Wiley- Blackwell and Jstor databases were the most convenient sources of critical literature reviewing 3, 4, 3 and 5 relevant papers correspondingly, search within Springerlink gave no result.

As it could be seen from Table 2, sometimes flexible approach (marked as “flex.”) was employed in order to find a greater number of relevant articles and that consider adding of step 5.c. and 5.d., whose provide search by one of the full phrases like: "supply chain AND Digital OR IT OR electronic AND Strategy" and "supply chain AND Digital OR IT OR electronic AND Strategy AND enterprise". As this kind of search by full phrases is pretty strict, in the cases when the search within some particular database found papers of high quality but little number of them, evaluated that database as highly important and, thus, considered opportunity for extended search. The flexible search justified itself and gave additional 26 relevant papers. Taking into account the fact that strict search resulted just in 15 papers this number is crucial.

In order to identify temporal trends on study on digital supply chain experiences the articles were categorized by years of their publication. Analysis of distribution of articles by years is provided by the following Figure 2.

There are 15 publications in the journals that have been found. Figure 2 depicts the article distribution over the study period (2000-2020). The study reveals that between 2018 and 2020, the number of articles has increased significantly, with a marginal decline in 2020. Researchers' enthusiasm is growing, as seen by this rising trend.

Based on the results of Figure 2, a conclusion has been made, that theme of enhancement of a SCM system as a part of an enterprise development strategy in the transition to digital ecosystem is important nowadays.

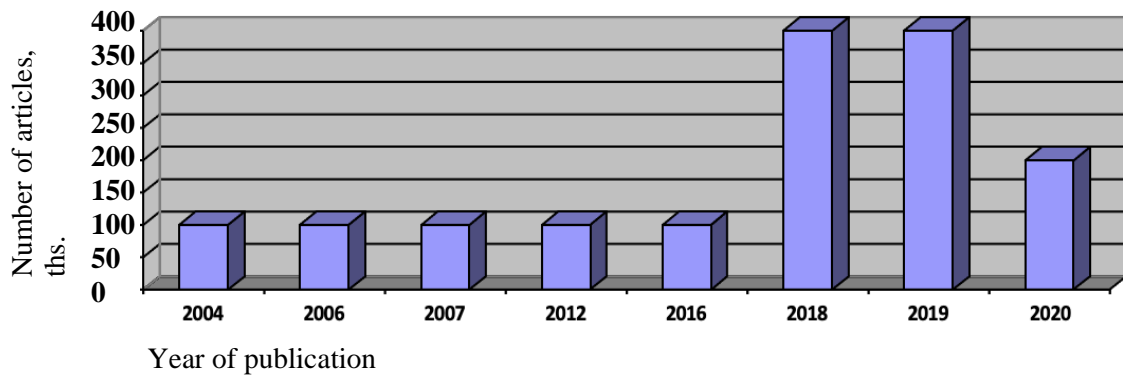


Figure 2. Distribution of relevant articles per year

Businesses that incur a huge loss from the wrong decisions concerning the Industry 4.0 innovations are also important to the operations of the SCM. It causes damages of FV and also company losses. That's why it's necessary for businesses to identify all Industry 4.0 features that can contribute to make operations efficient in the SC and obtain sustainability.

In order to understand better the main ideas of the existing literature, compare, synthesize the results of the previous research in supply chain, and supply chain in digital economy, method of synthesis by quality criteria was employed. The version of quality synthesis utilized here was suggested in 2005 (Thorpe et al., 2005) in the work about small and medium-sized enterprises. The approach called for categorizing all related experiments into three groups: A, B, and C. The letter "A" denoted experiments that were unquestionably important. Studies classified as "B" had a priori relevance that was unclear. Studies classified as "C" were those that were less important or the purpose of the research study was uncertain (Thorpe et al., 2005).

Because adaptation and interpretation of Thorpe et al. method for current research required significant changes, description of quality criteria for including papers to A, B and C groups is considered below in an effort to identify distinct quality characteristics at the most beginning of the analysis. So, in our sample list A includes definitely relevant research papers that meet the following requirements:

- data analysis (quantitative or qualitative);
- results presentation (description of observations tables);
- interpreting results and drawing conclusions;
- clearly describing research methods.

List B consists of partially relevant studies:

- analyzing various datasets and sources of information, including literature sources, for

research that meet the criteria;

- raises new questions to study.

Finally, list C includes less relevant studies with:

- creating a search strategy based on clear inclusion requirements for the selection of qualifying studies and designing a review query.

According to the quality selection criteria by reading remaining abstracts and full papers the following distribution of research articles was determined:

1. List A – 5 papers.
2. List B – 6 papers.
3. List C – 4 papers.

The list of articles includes definitely relevant research papers that meet the following requirements: answers to all research questions; using quantitative or qualitative approaches to analyze data presenting the data in Table 3 that summarize the findings.

Table 3. Describing the main findings of the papers

Name of author(s),y.	Title of the article	Key findings	Theories & Concepts
Dara G. Schniederjansa, Carla Curadob, Mehrnaz Khalajhedayatia. (2020)	“Supply chain digitalization trends: An integration of knowledge management”	The goal of this article is to explain potential studies for researchers to expand their viewpoints and exploit information management to strengthen the digitalization of the SC research paradigm. This is achieved by both a wide range of case studies of research and also a textual analysis and prediction of digitalization frameworks, developments and issues in industry and sector	Trying to apply the impact of information analysis to SCM through a theoretical perspective for information management, this article offers potential analysis investigations on how researchers should use the generally neglected fields of digitalization of the SC on developing areas to understand how to better investigate the human component in SCM
Janet L. Hartley*, William J. Sawaya. (2019)	“Tortoise, not the hare: Digital transformation of supply chain business processes”	Authors summarize the potential of each innovation and estimate its future broad- scale acceptance	Authors used interviewing with a huge corporations as a method of analyzing the issues of the article. Authors explained, that successful implementing innovations by companies should follow the appropriate initiatives: (1) determine a visionary SC elements that can shift across the labyrinth of innovations and the increasing digital world, (2) create a digital future vision map for their SC operations, and (3) upgrade fundamental IS.
Paul-Eric Dossou (2018)	“Impact of Sustainability on the supply chain 4.0 performance”	The analysis of large system modeling and multi-criteria research allows the definition of a modified paradigm explicitly aimed at enhancing the SC 4.0 principles for SMEs. As a results, this concept combines social and environmental aspects	Sustainability is regarded as essential for the efficiency of the DSC. The concept of article is to assess the complexities of the application of the DSC 4.0 and Industry 4.0 (Society 5.0) principles in small and medium enterprises, to recognise the barriers and to identify a strategic plan to accelerate this process. Aspects for the creation of a collaborative, co-creative and co-innovative tech platform for transforming SME efficiency to DSC 4.0 principles and taking sustainability issues are discussed

<p>Yasmine Sabria,* , Guido J.L. Michelia, Cali Nuurb. (2018)</p>	<p>“Exploring the impact of innovation implementation on supply chain configuration”</p>	<p>This article examines what results expected from the applying into process and product innovation practices according to DSC 4.0. It also includes outlines the digital supply chain approach and setup of four product families and finds the setup to combine the full spectrum of supply chain features and connections</p>	<p>The article addresses that there is an insufficient focus given in SCM 4.0 research to the innovation management component, and creates a structure describing the complexities between execution of innovation and actions and configurations for specification. The studies offered executives to help handle the application of technologies along the SC</p>
<p>Gülçin Büyükoçkan*, Fethullah Göçer.(2018)</p>	<p>“Digital Supply Chain: Literature review and a proposed framework for future research”</p>	<p>Article observes central linedigital supply chain studies, analyzing systematically studies and discusses past existing research</p>	<p>Authors used systematic literature review the previous case studies-method of analyzing. The explained digital supply chain system seeks to implement convergence between digital transformation, integration of technologies and delivery of products and services. Decomposition of the elements of digitalization SCM show the researcher new model of transformation the business processes</p>
<p>Ivanov, D., Dolgui, A. and Sokolov, B. (2019)</p>	<p>“The impact of digital technology and Industry 4.0on the ripple effect and supply chain risk analytics”</p>	<p>It's the 1st research that links the viewpoints of industry, data, engineering and analytics on digitalization and supply chain risks</p>	<p>Through addressing the issues of (1) what partnerships occur between big data analytics, smart manufacturing, additive manufacturing, advanced trace & monitoring systems and SC disturbance threats, this study contributes to the literature; (2) how digitalization can lead to improving ripple effect management, and (3) what digital technology-based enhancements can cause supply chain risk analytics innovations</p>
<p>Garay-Rondero, C.L. et al. (2019)</p>	<p>“Digital supply chain model in Industry 4.0”</p>	<p>It defines the key elements of fourth industrial revolution and their effect on DSC operations, guiding the plan for a new conceptual paradigm that discusses and enhances a view of the future of interconnectivity between various digital supply chains, clustered in groups to create value via innovative ways of collaboration and digital convergence</p>	<p>A creative and detailed description of the key ideas and elements motivating the evolving and existing digital supply chains is given by the research methodology - model. This conceptual structure would further allow scholars to analyze information about the parameters and elements presented, as well as to validate recently discovered functions and structures in order to explain the emerging ways of collaboration and application of smart manufacturing in digitalized supply chain systems</p>
<p>Tiwari, S., Wee, H. M. and Daryanto, Y. (2018)</p>	<p>“Big data analytics in supply chain management between 2010 and 2016: Insights to industries”</p>	<p>This article describes big data concept between 2010-2016 in SC and provides companies with perspectives</p>	<p>Authors used review-method of analyzing. Research paper adds to the application of big data important facets of SC by presenting recommendations for scholars and researchers</p>
<p>Ghadge, A. et al.(2020)</p>	<p>“The impact of Industry 4.0 implementation on supply chains”</p>	<p>The goal of the analysis is to examine the effect of the introduction of smart manufacturing on DSC and to establish a mechanism for introduction by identifying additional drivers and obstacles to the industrial revolution model</p>	<p>In order to discover the important components and obstacles to the introduction of DSC, a critical literature review is undertaken under 4 market aspects: strategic, operational, technical and moral and regulatory. Understand the effect of the introduction of Industry 4.0 on DSC parameters, a complex system model was later established, incorporating both the defined driving forces and challenges to this technical transition. Model can help the company to implement innovations by dint using successful model created by the authors.</p>
<p>Ardito, L. et al.(2019)</p>	<p>“Towards Industry 4.0: Mapping digital technologies for supply chain management-marketing integration”</p>	<p>This study offers useful knowledge concerning what digital technology will allow the incorporation of supply chain management. Especially, by focusing on current real cases, the authors illustrate the role these approaches perform in terms of knowledge retrieval, processing and elaboration for DSC incorporation. In addition, article presents entities more interested in the creation over time of new technology for logistics adoption and provide an overview of</p>	<p>The article adds to the DSC integration and smart manufacturing literature supporting innovations that which help, in general, to handle the automation interface from an overall perspective by using digital platforms described in research</p>

		their technical influence in the adoption of digital technology	
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Following Büyüközkan & Göçer (2018), The author intends to fill a void in previous research by developing a comprehensive philosophical or methodological structure for DSC. The suggested architecture seeks to define the characteristics, materials, and technological enablers, as well as the obstacles and success drivers, for transitioning from a DSC to a digital economy (Büyüközkan et al., 2018). That's why, it's necessary to decompose framework for the digitalization of DSC.

To meet these changing customer needs, every business has to use a digital roadmap. The problem is knowing how and where to start the work. There is a lot of hype around digital technology and there are many opportunities to apply it to the value chain. Mostly (especially when no proven return on investment (ROI)) the necessity of development and implementing a beneficial digital policy can seem extremely challenging. One reason is for sure: If companies turn to the most brilliant new technology to save the time, but forgot their shared performance perspectives and brand missions, it means that the chosen strategies failed. As a result, it's important to create a framework for enhancing DSC. Based on an analysis of the literature, Figure 3 depicts the structure in a graphic way.

On the other hand, certain SC executives will be familiar with the fundamental digital supply chain system methodology by using this framework: analyzing the current model of digitalization of the SC, creating a strategy for innovation adoption, and designing a transition plan for SCM in a DSC context. The nature of DSC integration process in a standard traditional model of logistics is the creation of these fields, their decomposition and development of their framework.

The 3 big decompositions and their arrangement will then be discussed then. By using features that used to classify and analyze the research, the key problems and challenges that need to be tackled are mentioned. Even though digital supply chain is applied and verified in a traditional model, more rigorous analysis focuses exclusively on these measures. The results of this review would be of concern to SC operators and firms choosing fully integrated DSC and digitally activated companies. The automatized SC decomposition descriptions are provided in the references below and the DSC creation structure as seen in Figure 4.

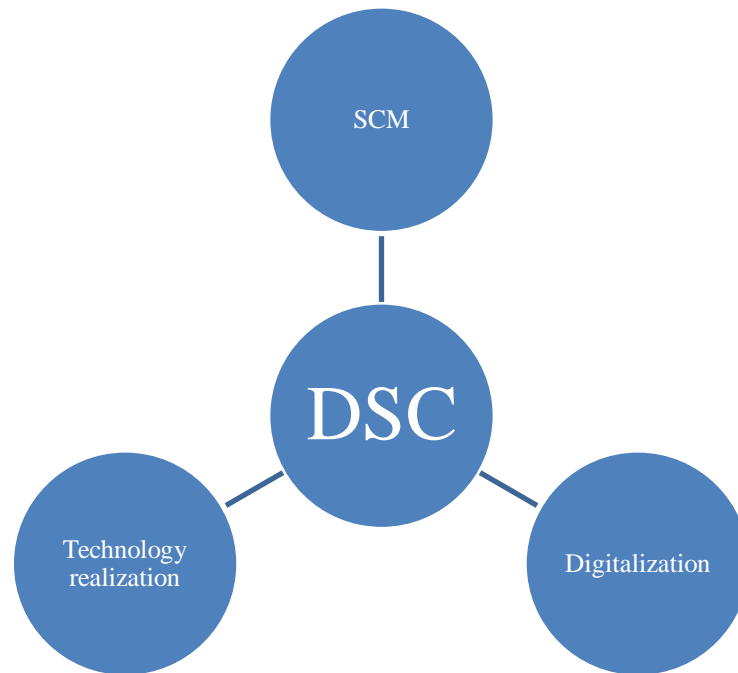


Figure 3. The design of a DSC structure

Finally, author will further break down the digitalization process, which begins with the Digitalization Approach, by setting up the first process of digital supply chain. The 3 other fields are then addressed by this method. It also tends to end up enhancing the quality standards and the Digital User Experience to better understand consumers.

The purpose of an efficient implementation of change can thus be divided on 5 particular sub-objectives, which presents the digital transformation phases. The efficient application of the various techniques relies on them.

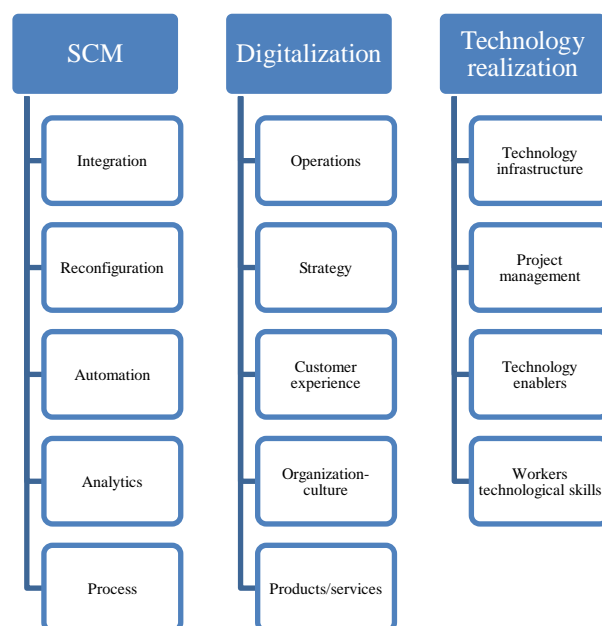


Figure 4. Overall infrastructure for the development of DSC.

Figure 5 introduces the model for DSC modernization.

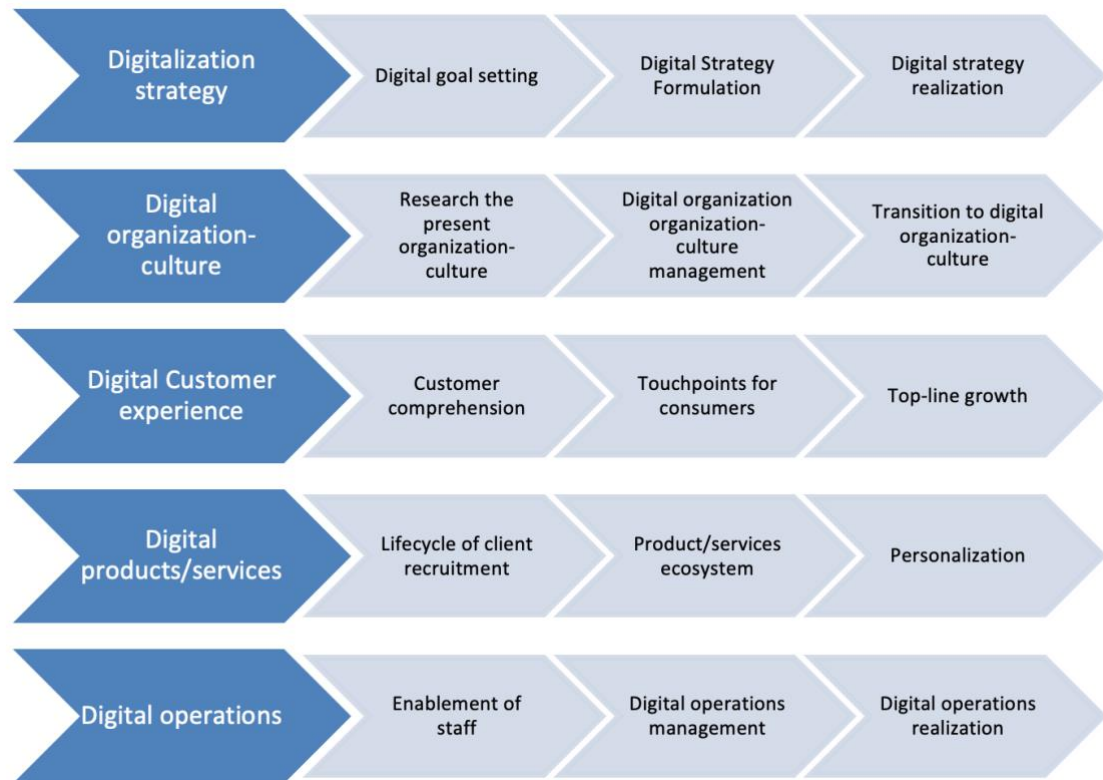


Figure 5. Fragmentation of the structure for the changing of DSC

Nowadays DSC is really in an era of automation. In order to build better forecasting systems and production processes, producers focus on the quality and quantity of information and monitoring, but also to handle operations more efficiently, deliver and monitor the flow of goods, and also handle workers.

The issue is this: the SC full digitalization is increasingly getting less of a possibility and much more of a reality for firms to stay sustainable and rival. The era of a silo-based SC is ended and corporations have to work to succeed on a worldwide scale in a more efficient, organized way.

The research has taken a wider look at the DSC and current problems within that area. Reviewing the literature, it's necessary to make a conclusion. Exponential rise in emerging technology implies that organizations' production plans are transitioning to digital ways. Each aspect of commercial operations, particularly in the SC, will proceed to pervade. Demand from consumers and the business landscape also ensures that concentrate companies are under constant pressure to build plans to organize, cooperate, integrate, digitalize and leverage technology properly in order to adapt effectively to consumer demand. In addition, since the level of DSC will decide the effectiveness of real-time product tracking, resource utilization, consumer interaction, and overall productivity, it is important that organizations become more informed about supply chain automation and how it can eventually contribute to increased production and efficiency.

It can give a lift to the fact that the literary review, this topic is relevant all over the world and all companies, especially within the framework of Covid-19, are switching to digital logistics management. It is especially important to try to implement the digitalization of the supply chain in Russia since an analysis of the literature in the RSCI showed that this topic remains unexplored to date and there is a large gap in this topic – Table 4 and Table 5.

Table 4. Analysis of publications in the bibliographic database of scientific publications of Russian scientists

Total number of publications by keywords “digital supply chain” and “agricultural enterprise”	2604
Number of articles in journals	760
Number of articles in journals included in Web of Science or Scopus	32
Number of articles in journals included in the RSCI	57

Table 5. Distribution by year publications

Year	Number of publications
2021	11
2020	353
2019	217
2018	432
2017	142

Where to put effort? The fundamental digital SC methodology would be recognizable to SC executives all over the world: analyzing the current condition of DSC, creating a strategy for innovation adoption, and designing a transition plan for SCM in a digitalization context. The nature of digital logistics implementation in a standard SC model is the creation of these elements, their decay and development of their foundation. Using the characteristics used to define and analyze the articles, the key problems and challenges that need to be tackled are mentioned. While DSC is applied and verified in a traditional SC, more rigorous analysis focuses exclusively on these measures. The results of this review would be of concern to SC operators and firms choosing for completely integrated DSC and technologically activated companies.

3. Theoretical foundations of logistics activities at the enterprises within the development strategy

3.1 Supply chain evolution – current state

Logistics is a structure, the elements of which are presented in the form of organizational links that control the volume of products required for the smooth execution of operations at the enterprise, as well as the movement of products, their introduction to the consumer market and the collection of complete information about contractors, target audience and transport. In addition, this division is responsible for checking material, production, information and financial transactions in order to organize a general logistics structure, which will include the sale of the product at the enterprise. It is clear that the main task of logistics is the integration of all production, technological and information processes into a single mechanism.

The DSC is known as supply chain management, and it covers all operations that transform raw materials into finished goods. In order to satisfy customer needs and achieve a competitive advantage, the company's supply-side systems must be optimized vigorously.

The situation associated with a sharp decline in production volumes is a consequence of the influence of both economic and difficult climatic conditions. Undoubtedly, these elements are directly interconnected, because the resistance of enterprises to adverse environmental conditions depends on the economic system's stage of lifecycle.

The use and improvement of logistics activities with the tools of Industry 4.0, as well as the organization of a highly efficient model of enterprise logistics in the future can reduce losses from adverse environmental conditions to zero. It is necessary to think about the application of new digital methods in the process of management, organization, movement of goods, procurement and financing. Analysis of a large amount of scientific literature was carried out on what characteristics are inherent in one or another stage of the industry's development in the framework of the course "The Impact and Benefits of Digitalization" (Ghoreishi et al. 2020), (Ferrantino et al., Undated), (Korpela et al., 2017), etc. This resulted in the following vision of Industries' evolution in Figure 6. Bottom line, this picture shows what once helped drive the appearance modern digital supply chain.

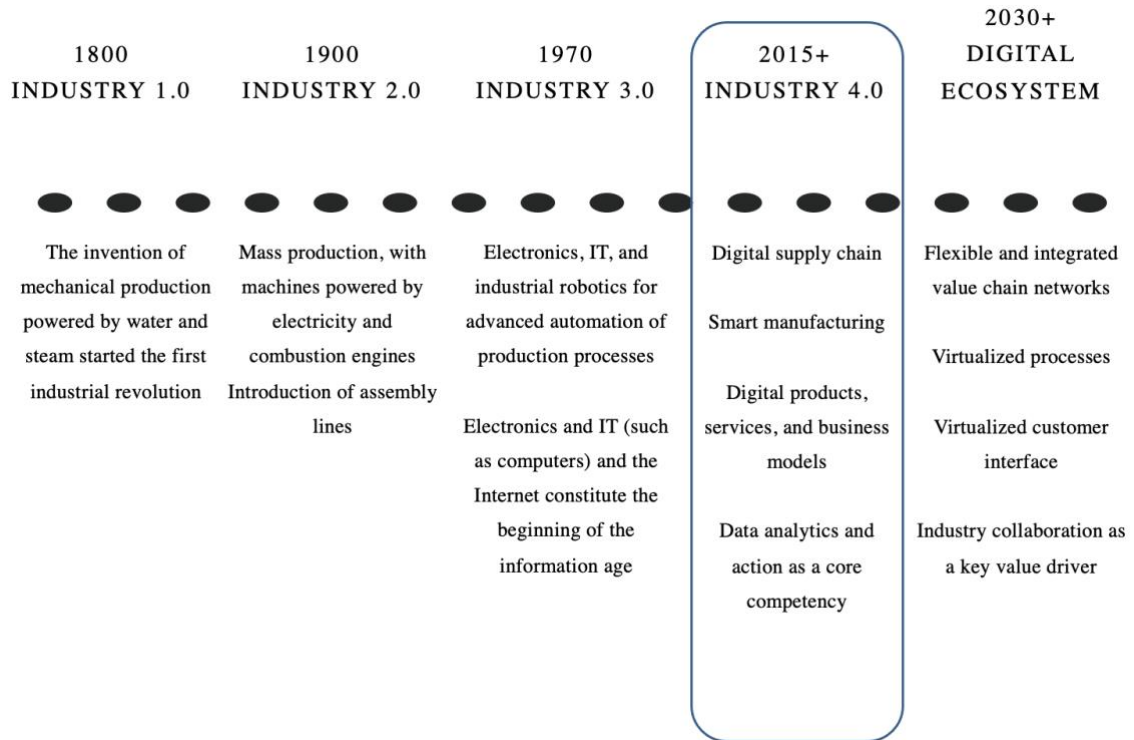


Figure 6. Evolution of industrial civilization

SCM attempts to centrally monitor or connect the commodity's production, shipping, and distribution. By controlling the SC, businesses can reduce additional expenses and deliver goods to the market more quickly. Internal stocks, internal manufacturing, storage, distribution, and company distributor inventories are all under greater management.

SCM is based on the idea that every commodity that reaches the market is the culmination of the efforts of several different firms that make up the supply chain. Despite the fact that supply chains have long existed, most companies have only recently accepted them as a beneficial complement to their operations. The head of logistics is responsible for the supply chain management of 5 its components:

- the plan or strategy of department;
- the suppliers (of raw materials or services);
- manufacturing (with a focus on quality and efficiency);
- delivery and logistics;
- the return system (for defective or unwanted goods).

In today's competitive market climate, digital transformation is no longer an option for producers and is more of an essential for sustainability. The previous 3 industrial transformations saw a major increase in the efficiency of businesses. Only the stage of the shop floor was influenced by the past industrial revolutions. Industry 4.0 is a more

sophisticated concept which, by incorporating support functions such as digitalization of engineering, drives efficiency even more (Ghoreishi et al. 2020).

The burning issue opposite industries, however, is the drawback of successful formula for organizing complete effective of the supply chain, all provided by automation and business processes. Efficiency is diminished by ineffective management, leading to financial primary and secondary damages. Under the digitalization of Industry 4.0, developing capabilities, updating the conventional organizational structure and management of change are vital levers. Thus, social, environmental and economic impacts do have significant effects on the organization and therefore need to be important for it.

In conclusion, businesses that incur a huge loss from the wrong decisions concerning the Industry 4.0 innovations are also important to the operations of the SCM. It causes damages of FV and also company losses. That's why it's necessary for businesses to identify all Industry 4.0 features that can contribute to make operations efficient in the SC and obtain sustainability.

The traditional supply chain can be represented as a linear "plan and control" model characterized by numerous and disjointed preparation periods, each with only a limited view of the supply chain. Compounding factors include the increased variation between customers, the disparity between production and real need, and increased inventories. The combination of these factors will lead to inadequate solutions, delays in on-time delivery (OTD), decreased productivity and performance, and increased costs and resources. The end consequence is an inability to attain operating excellence. In a stable and reliable market setting, this paradigm is highly functional — and has supported many companies well for years. In the new technological and disruptive world, it is clear that the conventional supply chain model is not a suitable match and a new model needs to be adapted. The Table 6 summarizes the dissimilarities between traditional and digital supply chains.

Table 6. Analysis of dissimilarities between traditional model and DSC

Traditional model of Supply chain	Digital Supply chain
Limited view of supply chain	On the stage of preparation and implementation, flexibility and quick response is essential
When information passes through a whole part of a company, it is delayed. There is a lack of clarity across the whole chain, which makes meaningful communication difficult	Both supply chain partners have access to the same details at the same time
As info-demand travels down the material path, end user's need is blurred to producer	The progress in partnership depth in order to capture supply chain importance
Delays and unsynchronized reactions in several levels due to various planning phases	Flexibility and quick assessment of changes in consumer needs

The onset of the coronavirus outbreak has intensified the digital transformation of the supply chain that has been languishing on the 'to-do' list of companies for years. Covid-19 has revealed obstacles to cooperation that are accepted under normal conditions by most businesses.

Today, because of closed borders and limitations on international transport, companies are facing a lot of problems. Those who can have a stronghold on their shipment's location at any given time achieve a competitive advantage. When a company can locate precisely where a shipment is being held and how long it will take to arrive, whether it is delayed or routed, they achieve the highest degree of flexibility.

Option to use sources like AI and blockchain, creating an immutable data trail will enhance business and customer trust in the quantity and quality of products manufactured, shipped, and distributed. Consumers often want to know that their goods have a Covid-19-free custody chain, ensuring that when moving through the supply chain, they have not been infected with the virus.

Overall, the introduction of new technology provides the supply chain process with additional transparency and confidence, exposing the availability and protection of products, thus speeding up their distribution.

3.2 The main challenges of a supply chain digitalization

In my opinion, each company in one way or another may face the problems of digitalization of any department of the company, especially the logistics one. That is why, using the analysis of companies and several sources of literature, I was able to identify several problems that a company may face in the process of implementing a digitalization plan for departments.

Each enterprise should seek to increased sales, better decision-making, more flexible operations, less effort, and healthier performance with implementing a DSC. However, companies are often faced with the difficulty of preventing the frictionless operation. However, there is still a need for deeper analyzing several popular stumbling blocks and figure out how to avoid them.

Catalogs that are out of time and have a low visibility. Many businesses launch their DSC deployment without even a specific roadmap that facilitates visibility and data collection in a timely manner (Kache et al.,2017). As a result, several companies don't have

a centralized, software solutions catalog that is regularly updated with correct details – particularly when it comes to pricing. Figures for pricing must be exact, usable in several currencies, and conveniently accessible. It would be impossible for employees within a company to predict their infrastructure budgets if knowledge within SC is obsolete or difficult to locate. Moreover, once a customer encounters obsolete or incorrect knowledge in the DSC, their confidence as a scheduling tool will be undermined. It may also lead IT teams to skip crucial renewal deadlines, stopping them from bargaining with tech providers or canceling unwanted licenses. Enhanced data collection is the only option for this. Big firms may need to invest in a SC digitalization solution to simplify routine admin duties such as tracking and combining all purchasing-related information.

Ineffective software and loss. It is an inevitability where a DSC has bad visibility, additional organizational procedures, and improper user integration. This encourages the rapid spread of "Shadow IT," which results in significant tech waste. The figures on unused tech expenditures are staggering: it is estimated that 37% of all software spending is squandered. Even so, by cleaning up the SC, company can recognize and enjoy benefits from this unnecessary tech investment (SoftwareONE,2020). Company should try to ensure the DSC is centralized and open to all users inside the company to identify and neutralize unauthorized devices. This entails dismantling organizational silos so that everyone in the company can see and contribute to the DSC. After that, it should integrate it into invoicing or a department's systems. This would make it easier to import and export information in a proper and efficient way.

Licensing Violation & Extreme Risk. Often companies don't monitor own DSC on a daily basis to ensure that current and existing arrangements are fulfilling proper usage rights, contractual terms, and risk aversion steps. It can lead to serious issues like license misuse, the waiver of basic property rights, and the abuse of access or protection policies. Such flaw of attention on the SC is lead to a reduction of joint collaboration efforts and lost opportunities for gain sharing in the SC growth field (Swanson, 2017). A software license control audit, ideally performed by a 3rd person, is needed to prevent security threats and license violation in the DSC. It will aid the company in identifying danger zones, locating over/underutilized software, and avoiding the purchase of unapproved software.

Systems that aren't linked and have a bad user experience. Most DSCs do not use a transparent, user-friendly method. Instead, the SC is made up of disparate parts that are difficult to keep up with on a regular basis. This is a common problem in industries; only about 1% of businesses have automated digital distribution that connects ordering, ticketing, sourcing, contract administration, and shipment (SoftwareONE,2020). Users had a bad impression as a consequence of the shortage incorporation, which may have a wide-

ranging influence on the company. Caused by a lack of agility, a user can request software and not obtain a license for weeks. Meanwhile, they can import illegal apps, which can trigger a slew of issues. Users would benefit from a smoother, more agile experience if the DSC is handled in a coherent, centralized manner. This reduces an amount of expenses and improves user productivity.

Failing to Maintain Control of Rights. The failure of an IT team to use current and future license entitlements is the most important concern with the DSC. Many companies lack systems for automatically capturing and normalizing entitlements, and many lack proper entitlement procedures entirely. Lost variants and editions, wrong license forms, inappropriate program binding, and the sluggish, manual production of license details are all implications of improper license entitlement management.

In fact, these issues are opportunity disguised – by addressing them in a structured fashion, businesses can find new ways to increase sales and to achieve maximize market results. Even then, since the average results of using DSC are so high, it's better to use advanced Automated Supply Chain tools or obtain guidance from 3rd experts.

3.3 Impact of DSC on the enterprise

Nowadays DSC is really in an era of automatization. In order to build better forecasting systems and production processes, producers focus on the quality and quantity of information and monitoring, but also to handle operations more efficiently, deliver and monitor the flow of goods, and also handle workers.

The issue is this: the SC full digitalization is increasingly getting less of a possibility and much more of a reality for firms to stay sustainable and rival. The era of a silo-based SC is ended and corporations have to work to succeed on a worldwide scale in a more efficient, organized way. The exponential rise in emerging technology implies that organizations' production plans are transitioning to digital ways. Each aspect of commercial operations, particularly in the SC, will proceed to pervade. Demand from consumers and the business landscape also ensures that concentrate companies are under constant pressure to build plans to organize, cooperate, integrate, digitalize and leverage technology properly in order to adapt effectively to consumer demand. In addition, since the level of DSC will decide the effectiveness of real-time product tracking, resource utilization, consumer interaction, and overall productivity, it is important that organizations become more informed about supply chain automatization and how it can eventually contribute to increased production

and efficiency. Digitalization of the supply chain can affect several participants in the commodity market how it's shown in Table 7.

Table 7. Analysis of DSC impact on market's objects

Object of the market	Impact
Companies	<p>1. The principle of Supply Chain 4.0 can be easily applied to an interconnected supply chain system in which information travels through all networks, analytics enable transition across the SC, and real-time reactions occur. Sensing technologies underpinning the Internet of Things (IoT), such as Radio Frequency Identification (RFID), Bluetooth, and GSM (Global Mobile Communication System), which link transport infrastructure to satellite systems, allows for rapid assessment and response to changes in customer demand, as well as monitoring and tracking across the supply chain. In specific, changes in consumer needs can be easily measured and handled. This approach has had a great deal of adoption. As shown in a new PwC report on the growth of Business 4.0, one-third of the more than 2,000 participants indicated the businesses have begun to digitalize the supply chains, and 72% plan to do so 5 years within next;</p> <p>2. Big data and supply chain monitoring are helpful for creating real-time decisions. Related implementations of big data analytics include early warning mechanisms (Are we about to run out of something or hit a bottleneck? Were the prices we were interested in just going up?), predicting algorithms (What will the demand be like next quarter or six months from now?), SKU rationalization (the determination of the right variety of products, or SKUs, to be offered to consumers at any given time), and channel assessment (the recommendation on the best path to get the commodity to the end of the market);</p> <p>3. The introduction of Supply Chain 4.0 to production facilities is often referred to as the "smart factory" (Pfohl et al. 2015). Integrated data capture modules, using either Automated Detection and RFID technology, can be built into much of the industrial machinery. The knowledge can be transferred as a M2M and turned over to the supply chain command center for decision-making. Intelligent technologies refer to the control and reconfiguration of robotics across bilateral and multilateral computer systems. Internal intra-logistics necessitates the use of self-driving vehicles to transport goods based on externally supplied evidence. The ability to do predictive maintenance is amongst the most important features of the Digital Workplace. Through the use of technology to sense repair requirements in anticipation of possible failures decreases installation costs;</p> <p>4. Smart logistics requires not just the arranging of transport, but also operations inside the facility. It is in the factory where much of the very significant improvements have already taken place. As previously said, a few of the big changes is that both the warehouse and the consumer became even more accessible to one another, resulting in product flows not just from the manufacturer but also from the manufacturer to the retailer as a result of the customer's final orders. Whenever it comes to e-commerce,</p>

	automation has made the warehouse accessible to consumers.
Client	To access product details, shoppers can check barcodes for items. Digital price tags can adjust in real time based on demand or other factors. The retailer's "smart shelves" could detect low inventory levels. The idea, known as the Internet of Me, entertains shoppers in a shopping setting with the aid of both smartphones and in-store devices.
Employee	Mandel shows in a fascinating recent contribution that e-commerce-related supply chain activities in the United States have generated a large number of jobs over the past decade – more than twice as many as the drop in store-based retail jobs at the same time (Mandel,2017).
Global Value Chain	<p>1. Supply Chain 4.0 is designed to develop key management capabilities, such as objective finding, information gathering, and analysis. Companies can reduce the number of phases of the supply chain and move routine labor-intensive processes to industrialized nations to decrease the cost of monitoring and regulating development parts, thus minimizing coordination and handling costs;</p> <p>2. Another possible effect of Supply Chain 4.0 applies to the relationship between businesses and governments. Optimized SCM could contribute to improved traceability of products and financial data. This will find things simpler for companies engaging in foreign trade to conform with laws of origin by offering a detailed audit trail and make it simpler for policymakers to track those forms of tax avoidance.</p>
Environment	<p>1. Control successful production and consumption forecasting to decrease overproduction.</p> <p>Mismatch of production and consumption results in too many or too few sources of raw materials, creation of products, or delivery of goods (Salmela et al. 2009). This causes redesign and excess that has an environmental impact. Artificial intelligence, artificial learning, and predictive processing will forecast likely needs and ensure even more effective manufacturing processes;</p> <p>2. Incorporating accountability and ensuring that this is achieved.</p> <p>Suppliers Use Ethical Procurement Chain administrators require insight into how distributors extract or process raw resources to ensure that they meet environmental requirements. Blockchain technology is a valuable means to catch and check retailer procurement activities and IoT equipment tracking and reporting on working environments and environmental factors;</p> <p>3. Refine ways for reducing fossil fuel emissions.</p> <p>When transportation shifts to hybrid and other renewable vehicles, road optimization has been one of the easiest solutions to decrease the effects on the environment of transportation. Artificial intelligence may function with GPS systems to optimize regional, domestic, and localized supply lines. Advanced analytics will also change directions in live time, taking into account traffic and other problems;</p>

	<p>4. Organize deliveries with optimum use of cases and shipping.</p> <p>A blank box is a wasted box. Predictive analytics will forecast where and when products will arrive and consolidate shipments from different sources to the different end destinations. Which allows the most effective use of assets (i.e. containers, trucks, etc.) and transport, minimizing the overall emission of greenhouse gases produced per unit of freight;</p> <p>5. Research for current ecological threats and effects.</p> <p>Some supply chains are now threatened by global warming and other environmental causes. Wildfires on the west coast of the USA, increasing sea levels, water scarcity, and lower agricultural yields all have a significant impact on the supply chain's productivity, consistency, and tempo. Supply Chain Management helps to predict these threats and enables logistics to mitigate their consequences and bring in motion contingency planning.</p> <p>6. Optimize SC procedures for waste avoidance.</p> <p>Supply chains may be changed by radical reforms, but it is most popular to see success by incremental, iterative changes. Good research and monitoring work using machine learning to consistently enhance processes in the supply chain. Any reform that marginally decreases duplication, accelerates distribution, or increases efficiency will lead to a modest, gradual increase in sustainability.</p>
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According to CEPR analysis COVID-19 shows that many companies may not truly comprehend their chain management integration's vulnerability to foreign shifts (Centre for economic policy, 2020). New supply chain technologies and digital innovation are successfully emerging, allowing for improved connectivity across the end-to-end supply chain as well as increased stability and longevity without the usual "overhead" synonymous with risk control activities. Increased financial performance and reliability of knowledge collection, error tolerance (information is repeated in each branch if the device crashes, the information is not lost), enabling B2B communications, creative approach in terms of inventory monitoring, and transparency are all benefits of automating the SCM. By using blockchain, IoT, IoB, AI, robotics, QR, and RFID technology, it is necessary to monitor components in the supply system, smart contracts, openness, no need for intermediaries, automation, and global accessibility.

4. Overview of the agro-industrial complex processes in Russia

4.1 Structure of the agro-industrial complex

The agro-industrial complex is a complex of industries interacting in the conditions of agricultural production, its sale, and promotion to the market. The economic environment has a set of requirements, within the framework of which an agro-industrial complex enterprise can be successfully implemented by producing a product that has value for the end consumer, intermediary or state.

Let me consider in this chapter the most pressing problems of production and economic activity and management in the field of the agro-industrial complex of Russia, which require careful research, analysis, and continuous development. One of the most important issues remains the development of unique production facilities, the productivity of which will subsequently be at a qualitatively new level. In addition, there is a growing trend of unequal barter between agricultural areas with others. Undoubtedly, the deterioration of the company's fixed assets, including machines, can be a factor in reducing labor productivity in agriculture. In addition, it is very important that the external counterparty, the state, guarantees favorable conditions for the operation and interaction of the agro-industrial complex. The main role of the state is to establish scientific methods and instruments for market regulation, as well as to stimulate economic entities of the agro-industrial complex of Russia, its regions, and business units. It should be in mind that in modern conditions it is necessary to pay particular attention to the integration of Industry 4.0 trends and logistics in order to organize the global organization of different agro-regions, which need to stabilize performance indicators.

The efficiency of the agricultural industry, as a rule, is also determined by the results of other areas of economic relations. The agro-industrial complex includes a complex of areas of the national economy, united among themselves with the aim of improving their production and selling agricultural goods to the final subject of market relations. It is generally accepted that the scientific and technical revolution has become the source of the progress of the agro-industrial complex, as well as the interaction between industry and agriculture. Analyzing the agro-industrial complex and its development government programs suggest that for the agroindustry determined following goals, which are presented on Figure 7 (FSSS, 2019), (the program "Development of land reclamation of agricultural land in Russia"):

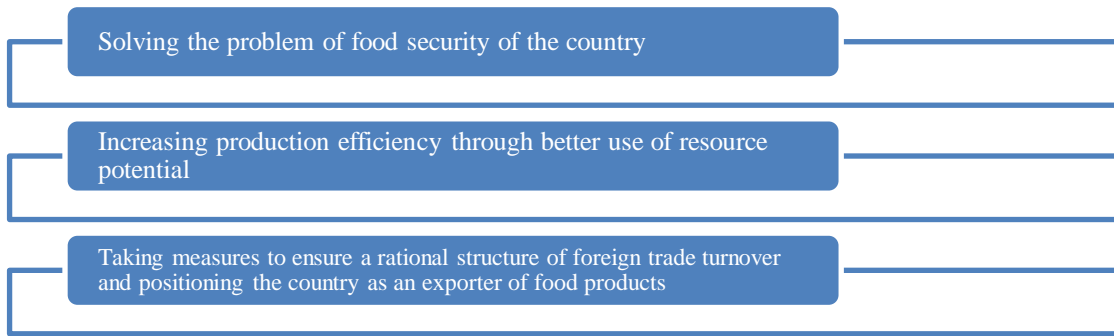


Figure 7. The main development goals of the agro-industrial complex

The final goal of the work of agricultural enterprises is to satisfy the needs of the end consumer of agricultural food products in the context of cost optimization. The standard of living of the population of the regions of Russia, as a rule, is subject to the degree of progress in the food and processing regions. Agro-industrial complex companies, which make up the third group, form 17% of production assets, 36% of the total volume of goods sold, and more than 15% of the working population (FSSS, 2020). From which it follows that the aggregate of the agro-industrial complex includes companies or entire areas of organizations that manufacture process raw materials, provide services for the production of machinery, and produce ready-to-use agricultural products.

As a rule, agro-industrial complex enterprises are classified according to the form of manufactured finished goods into the following types: a complex of non-food goods and a food complex. The main task of the development of the agro-industrial complex is, first of all, to stimulate the volume of sold products through progress at each stage of product creation.

Agribusiness enterprises are classified as follows on Figure 8 (Vinogradov et.al, 2015). The first group of enterprises includes such product creation areas as crop and livestock production. Each of these areas is also classified by a line of business. From which it follows that rural products are unique since they cannot be created by enterprises of other industries.

The second group of enterprises includes the following areas of production: the manufacture of equipment and additional parts, mechanical engineering aimed at supplying the field of animal husbandry, as well as the production of feed production, equipment for the creation of mineral fertilizers, as well as microbiological analyzes, the construction of agricultural facilities. Enterprises of the second group, as a rule, supply raw materials for the production department, and are also auxiliary entities that ensure the successful development of each production unit. The productivity of this group affects the rate at which an agricultural product and final product are created. Such a classification of

enterprises, in my opinion, is the most clearly defined and subdivides the enterprise into either producing or processing.

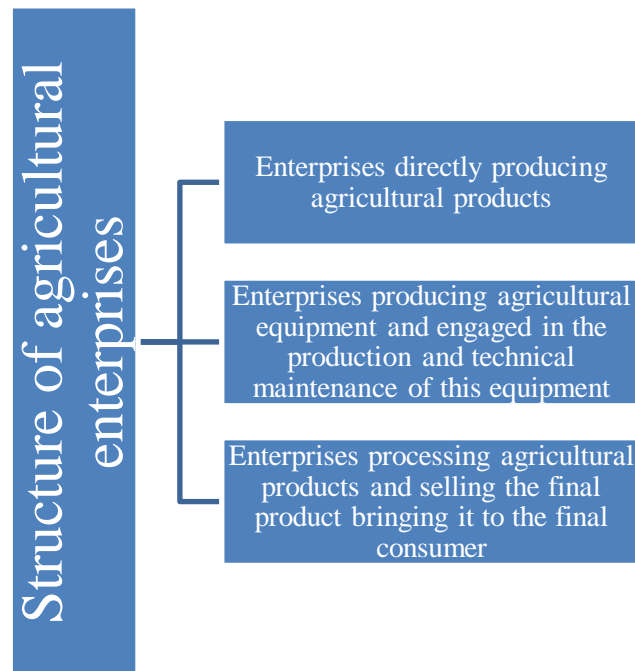


Figure 8. A variety of agro-industrial enterprises

The third group of enterprises includes such areas as meat, dairy, flour and cereals, and fish production. Light industry in the field of agricultural products processing is also part of this group. The areas of these types of activities of the agro-industrial complex guarantee the creation of finished agricultural products and their storage, repeated processing, and sale to the final consumer.

Today, investing in Russian agriculture has become even more attractive. Typically, a significant cash flow is attributable to the purchase of property, plant, and equipment. Nevertheless, this direction of the agro-industrial complex still needs to solve a set of problems.

Recently, there has been a tendency for a decline in the rate of development of agriculture from the rate of growth of economic activity as a whole. Unequal barter of areas in this direction with other areas tends to grow. That is why there is a continuous rise in the cost of material and technical materials and energy resources used by agricultural producers. Under the resulting economic circumstances, an entire third of the country's agricultural organizations turn out to be unprofitable.

Many experts began to differentiate enterprises into those that are actively developing and have excellent financial results, as well as those that are in decline and are close to collapse

(Tkachev et al., 2015). In addition, there is a decline in technical equipment in the agro-industrial complex. That is why a large area of fertile land is simply not used or fertilized. From which it follows that a radically transformed social policy of the state will be able to influence the economic situation in the field of agriculture for more stability of the Russian agro-industrial complex market.

Decision-making on social issues in the Russian Federation is possible only with the help of a state program, for the implementation of which it is necessary to seriously change the course of budget funds. However, the efficiency of enterprises will be achieved only in the context of optimizing the potential and profitable functioning of the agro-industrial complex in the economic environment. In my own opinion, the main criteria for the quality development of the agro-industrial complex include:

- 1) ensuring a favorable operating environment for the balance of all parts of the agro-industrial complex;
- 2) fulfillment of tasks to consolidate relationships between all spheres of the agro-industrial complex.

Using a SWOT analysis of the industry, it's easy to reflect the analysis of the internal and external environment of the industry, as well as the strengths and weaknesses, threats, and opportunities for the development of agriculture on Figure 9.

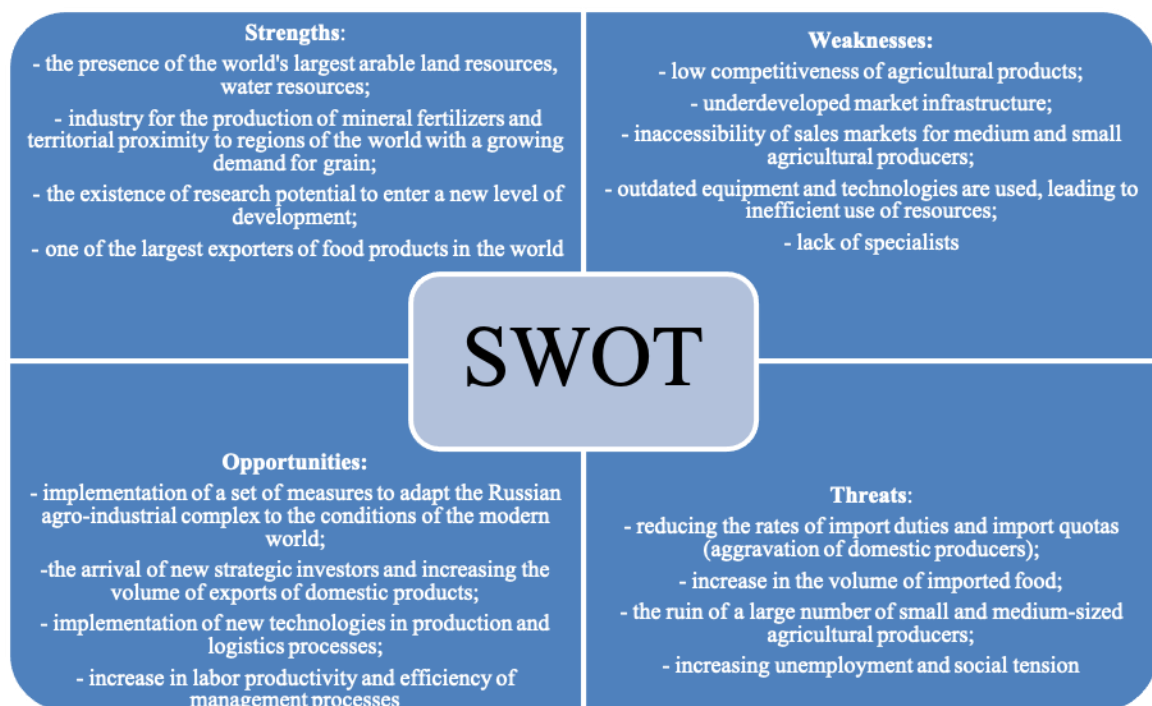


Figure 9. Agriculture SWOT Analysis

The problem of improving the Russian economy's competitiveness has become particularly

relevant as a matter of our country's entrance into the WTO, and its solution is one of the potentials for incorporating clusters as forms of regional grouping of production. Agriculture clustering allows for the unification of higher-level structures, whose workers are linked by common economic goals and equivalent cooperation. First of all, the introduction of agro-industrial complex clusters can significantly reduce the unemployment rate in the regions of the country, and secondly, systematically provide these regions with high-quality agricultural products. That is why the country's agriculture will have to go through a difficult stage of adaptation to the conditions of the WTO.

Next step is to investigate the microenvironment of agricultural organizations using Porter's "5 forces" competitiveness model. For the analysis of agriculture, it's better to compose the following Table 8.

Table 8. Agriculture Industry Analysis by Michael Porter

Criteria	Importance	Definition	Measure
Intra-industry competition threats	High	Struggle for the necessary element of production - pastures and storage facilities - to maintain the quality of goods on special elevators	Constant monitoring of competitors' activities. Improving the qualifications of employees and their skills in the field of agriculture
Threat from substitute goods	Low	There is no danger of the appearance of substitutes for agricultural products	Maintain and improve the quality of manufactured goods
Threat from a new competitor	Low	The need for a large number of financial investments in order to enter new markets: the acquisition of shares, as well as agricultural equipment, storage facilities, exposure to the influence of natural and climatic conditions	Constant monitoring of competitors' market. Creating a unique product offer, as well as the development of a customer loyalty system
Threat of supplier instability	High	A large amount of costs is spent on the purchase of raw materials and feed. Higher prices and qualitative deterioration of resources can increase the cost of production, which means a small crop will be harvested	Negotiating price reductions
Threat of losing regular customers	High	Consumers are factories that carry out industrial processing of the product and the subsequent sale of the finished product to the final subject of relations	Continuous improvement of enterprises, as they process agricultural products

Thus, industry analysis identifies and predicts the key factors for agricultural success. KSF is a single controlled variable for organizations in this industry, the use of which will strengthen the competitiveness in the market. Table 9 reflects the KSF of the agro-industrial complex's success.

Table 9. KSF of the agro-industrial complex

Type of the KSF	KSF of the agro-industrial complex	The presence of this KSF at enterprises
Scientific and technical factors	High scientific and technical potential	Yes
	Ability to quickly adapt innovations	No (lack of investments)
	Experience in research and development	No (lack of research institutions)
Production factors	Low level of expenses	No (high level of expenses)
	High quality of the product	Yes
	Established relationships with suppliers	Yes
Marketing factors	Wide network of wholesale distributors	No
	Own retail network	No
Management factors	Effective organizational structure	No
	Extensive experience in management	No

As a rule, processing organizations, in the absence of an optimal market structure, abuse their monopoly position, deliberately dump purchasing and overstate selling prices. As a result, in many regions, small production companies appeared for the processing of raw milk, meat, as well as oilseeds, etc.

This led to the fact that regional manufacturers began to invest significant amounts of money, and due to the lack of capacity to manufacture and process products, irrational costs arose. As a result, there was a loss of raw material zones and only partial use of production capacities by processing companies. Due to inflation for the processing of resources, manufactured food products turned out to be more dependent on external conditions, from this decline in competitiveness and the emergence of import substitutes.

Summing up, the analysis carried out as the primary strategies for the development of

agricultural enterprises showed:

- 1) expansion of land reclamation of agricultural land in the Republic of Tatarstan, which includes work on reforming and technical change in the framework of the innovative technological policy of agricultural production companies, and the allocation of funds to them for the implementation of the program "Development of land reclamation of agricultural land in Russia";
- 2) technological reform of agricultural machinery and equipment in the context of allocating funds to manufacturers of agricultural equipment, and offering special preferential terms for the purchase of this equipment by agricultural enterprises;
- 3) activation of investment activities in the agro-industrial complex, which implies preferential and investment lending to agro-industrial complex companies, as well as reimbursement of direct costs for the production and improvement of agro-industrial complex facilities, and for the purchase of machinery and equipment.

Thus, the agro-industrial complex is part of the economic activity of Russia, and also has characteristic features caused by special social responsibility, but this area also depends on generally accepted laws of economics. It is possible to improve the performance indicators of the agro-industrial complex as a whole only under conditions of full provision of a favorable environment and the corresponding external factors and with the help of the subsequent unification of all economic units of the agro-industrial complex. Do not forget about the involvement of investments in each systematization of the agro-industrial complex, as well as strengthening state support for the agro-industrial complex of Russia, regions, and business units.

4.2 Analysis of the main indicators of the functioning of the agro-industrial complex

The agro-industrial complex of agriculture is recognized as one of the most important spheres of the economy while playing a major role in the development of the country since more than 60% of the population is located in rural areas. Thus, the agrarian industry of the Republic of Tatarstan employs almost 18% of able-bodied residents, produces more than 20% of the GRP, and organizes about 3: 4 market circulation. As a result, owning 2.6% of the land plots in Russia, almost 4.9% of its agricultural products are produced on the territory of the Republic (FSSS, 2020).

From which can conclude that the main task of the agro-industrial complex organization is

to produce goods of high quality since providing the population with healthy food is of a state nature and is part of the national economy development.

Today the agrarian complex is considered one of the fastest-growing areas of the Russian economy. In accordance with the general statistics of the federal service, during the deficit period for Russia in 2015, this sector was almost the only one that showed positive results - an increase of 2,6% compared to the base period, and in 2016 – 4,9%, since a record amount of grain was harvested. The Figure 10 illustrates the dynamics of investments in fixed assets of the Russian Agroindustry for the last 20 years (FSSS, 1995-2016).

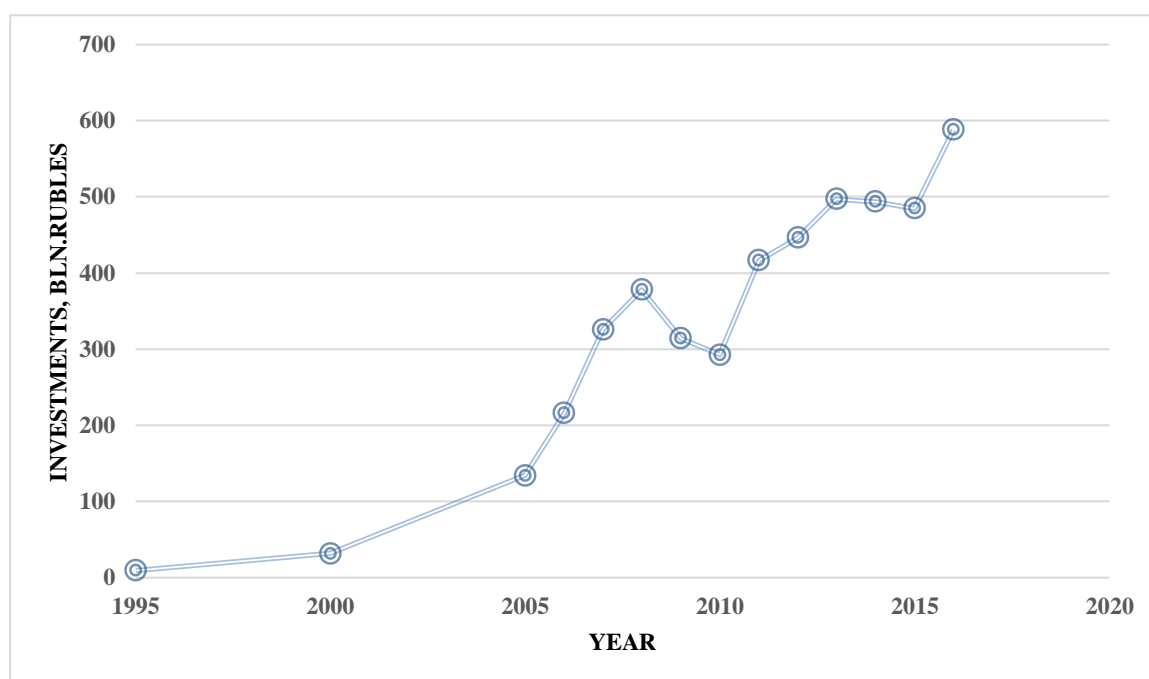


Figure 10. Dynamics of investments in fixed assets in agriculture in Russia, bln. rubles

In the agricultural sector of the economy, for the period from 2010 to 2016, every year it produced agricultural products by an average of 3998062 million rubles, in addition, sales volumes increased by almost 434035 million rubles or 12,87% annually (FSSS, 2010-2016).

Despite the growth in efficiency indicators, agribusiness enterprises still continue to find themselves in a difficult financial situation. The reason for this situation is the strong subordination of the country's market to foreign food products. It is rather necessary to change the priorities in relation to the consumption of domestic rather than foreign agricultural products.

Particularly acute during the application of economic prohibitions was the issue of the limited development of the industry due to the lack of the necessary level of financial investments in the agro-industrial complex. Agricultural enterprises encountered obstacles such as restraining imports, the lack of preferential lending terms, the emergence of

financial obligations, and the deprivation of guarantees for the provision of resources and imported equipment. At the same time, there was a need for grain and fertilizers.

Despite the fact that the domestic market became free from the import of foreign products, the lack of finance at the agro-industrial complex remained and had a direct impact on the dynamics of agricultural growth. All of the above suggests that today the external factors of the market, as well as economic prohibitions in relation to our country, affect the stagnation of the industry of the agro-industrial complex.

Today, the federal services of the Russian Federation are implementing a list of economic measures to improve the economic activity of agricultural activities. In accordance with the Decree of the Government of Russia dated July 14, 2012 N 717 "On the State Program for the Development of Agriculture and Regulation of Agricultural Products, Raw Materials and Food Markets", the priority trends in the development of the federal agrarian policy are presented on Figure 11. State support is aimed at:

- 1) regularly provide the population with domestic food products;
- 2) organize and control the market of agricultural products, resources, and technical equipment of the agro-industrial complex, improve the interaction of its links;
- 3) provide the state with a favorable environment for entrepreneurs in the agro-industrial complex;
- 4) do stable land reclamation.

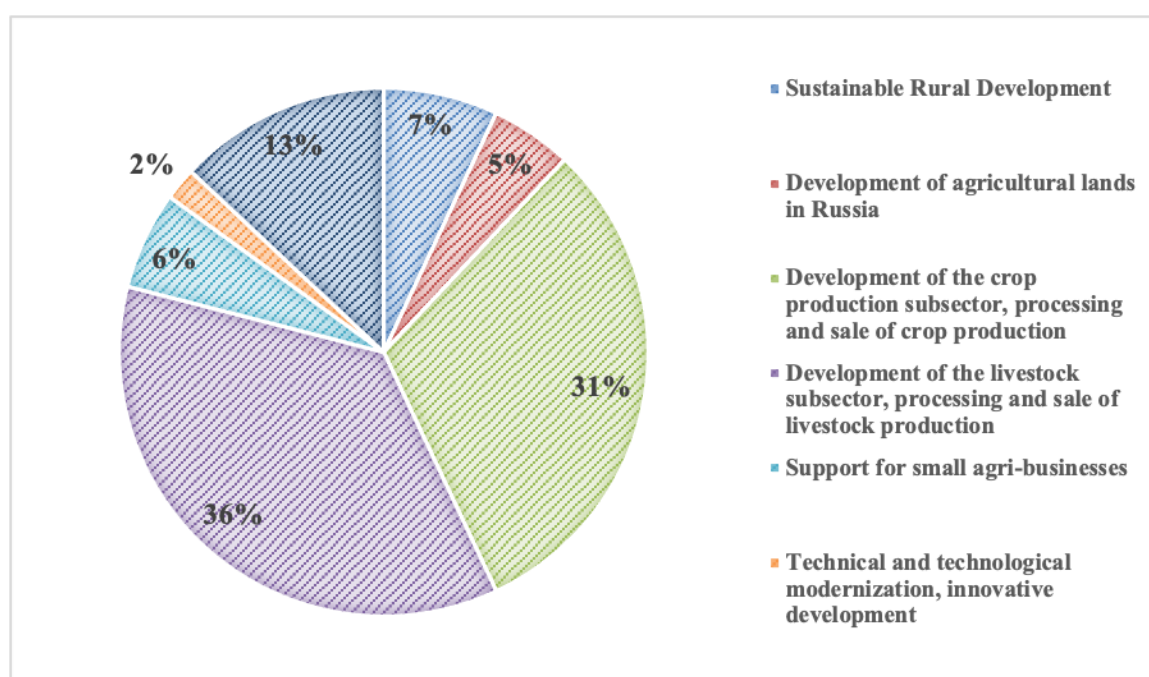


Figure 11. The structure of federal budget expenditures for the implementation of the state program for the development of agriculture

As a rule, the main goal of the agricultural industry is to increase the volume of production and minimize the total costs per unit. A finished product at agro-industrial enterprises is understood to be one that is marketed outside the borders of agriculture for food or industrial purposes. Within the framework of industrial processing, such a product is not final, but interval between two enterprises. Despite this, the agro-industrial complex food product that is not processed (grain, milk, meat) is included in the statistics of the final manufactured agro-industrial product.

The agricultural industry is primarily aimed at the manufacture of intermediate products, which will subsequently be sent for industrial processing, and the results of its work will be reflected in the intersectoral balance. That is why these results in the framework of the agro-industrial complex are intermediate.

It is generally accepted that the result of the work of agricultural enterprises is determined both by the results of agricultural activities and by the level of quality of interaction of all structural units performing the process of commodity circulation from production to the end point of the chain.

In a company or an agro-industrial complex, as a rule, the structure of a finished product includes a complex commercial product and a number of services, and a product transferred to employees for use. The final product (F_p) is calculated as the difference between the volume of gross output (goods and services) (V_{ps}) and the part of it required for use in a particular industry (P_p)

$$F_p = V_{ps} - P_p \quad (4.1).$$

The cost of the final product of the agro-industrial complex (C_f) is calculated from the total net product produced in the agro-industrial complex (NP_a) and a part of the net product of the food, light industry (NP_f), as well as the areas of circulation, transport and communications (NP_t)

$$C_f = (NP_a - NP_f + NP_t) \quad (4.2).$$

The productivity of agricultural activities is assessed using a set of economic data that help summarize agricultural activities. The leading parameters of the efficiency of the agro-industrial complex include the total volume of food and non-food products made on the basis of agricultural raw materials, per capita. That is, this indicator shows the degree of saturation of the population of the regions with food products, as well as products of the light and textile industries through the production and processing of intermediate

agricultural products.

In the process of determining the efficiency of an agro-industrial complex, as a rule, indicators of the cost of the final product per average annual employee (labor productivity), the sum of production costs and fixed assets (capital productivity) are used

$$E_f = \frac{C_f}{E_f} = \frac{C_f}{P_{cf}} = \frac{C_f}{PC_f} \quad (4.3),$$

where E_f is the average annual number of employees, people;

P_{cf} - the amount of production costs for the production of the final product;

PC_f - the cost of fixed assets of the agro-industrial complex.

The functioning of the agro-industrial complex is characterized by a high level of efficiency. For example, if general statistics on the national economy show that the ratio of the surplus product to the value of fixed assets reaches almost 24%, then in the agro-industrial complex it is about 34% (FSSS,2020).

The parameters of this indicator alternate in accordance with the interests in question. So, turning to state interests, it is necessary to remember how the country uses production resources, namely, land plots and labor. Thus, the indicators reflecting the overall efficiency of the country's agro-industrial complex include GDP per unit of arable land and per 1 worker. For the management, the main indicators reflecting satisfaction with their financial performance remain - this is the return on the company's net assets through revenue, net profit, and net revenue (the sum of net profit and depreciation), calculated as follows

$$RONA = \frac{\text{(Revenues from sale)}}{\text{Average annual net asset value of the enterprise}} \quad (4.4).$$

If, however, the values shown in the formula are reversed, the forward and reverse performance indicators will be reflected. So, the volume of goods per 1 consumed period of time is a direct indicator of the efficiency (productivity) of labor, and the time spent on the production of a unit of output is the opposite (labor intensity).

These formulas are applicable for calculations in any other industry, but in my work, they briefly and clearly convey information about how the milk yield is calculated, its ratio to the total number of cows, etc.

In addition, by changing the units of measurement, it is possible to demonstrate

comparable values, which are classified into physical, cost, and combined performance indicators. As a rule, natural ones are characterized by the efficiency of livestock of the agro-industrial complex, as well as labor productivity, productivity, reflecting the output of specific groups of goods per 1 production resource (ha, m², head of cattle) or per 1 used production factor.

Cost indicators are classified according to the type of prices applied. For example, they are included in the analysis of past performance based on reported, baseline, and comparable prices. The overall performance indicator of the agro-industrial complex will be affected by the dynamics of the volumes of agricultural products sold, the expansion of the offered range, as well as a significant increase in the quality of food products in conditions of optimal consumption of material and labor resources of the agro-industrial complex.

4.3 Place and role of dairy production in the system functioning of the agro-industrial complex

As a rule, each country chooses socio-economic development as one of the priority areas of development, which implies the guaranteed provision of natural food products, especially dairy products of good quality. According to the estimates of the staff of the National Union of Milk Producers "Soyuzmoloko", almost 23 thousand agricultural companies are engaged in the manufacture and industrial processing of this product today, employing over 1,2 million workers, and dairy products account for 17% of the total retail market turnover (National Union of Milk Producers, 2019). Our country is considered the world leader in dairy production in the ranking after the United States, India, China, and Brazil (Tkachev, 2015). Nevertheless, lately, the dairy industry of the agro-industrial complex of the Russian Federation continues to develop due to the gradual implementation of the federal program and technical equipment of production areas as presented on Table 10 (AB-center, 2020).

In addition, the mid-1990s were marked for both agricultural and dairy activities by a period of a significant reduction in production, and the dynamics of a decrease in the number of cows has not been overcome to this day.

Table 10. Indicators of milk production in the Russian Federation

Indicator name	1997y.	1998y.	1999y.	2000y.	2012y.	2013y.	2014y.	2015y.	2016y.	2017y.	2018y.	2019y.
Gross milk production, thousand tons	34125	33278	32256	31923	31165	29873	30049	29887	29762	30181	30526	31338
Number of cows, thousand heads	14545	13467	13134	12657	8856	8654	8524	8412	8243	8226	8207	7917
Feed consumption per 1 liter of raw milk at agricultural enterprises, c. to unit	1,2	1,2	1,2	1,2	1,2	1,7	1,4	*	*	*	*	*
Milk yield per 1 cow in enterprises, kg	2078	2245	2276	2336	4534	4524	4835	5139	4173	4302	4690	4752

* - no data available

The results of the financial and economic crisis in Russia, provoked by the irrational reforms of the 90s, have not been overcome. And the dynamics of growth in the production of dairy products are noted only in several regions of Russia as presented on Table 11 (Dairynews,2020).

Table 11. Milk production volumes in the regions of the Russian Federation

No. in rating	Region	The volume of milk production in agricultural enterprises in January-July 2020 (change in the indicator to the same period in 2019)
1	Republic of Tatarstan	731,77 ths tons (+5,7%)
2	Krasnodar region	638,5 ths tons (+12,1%)
3	Voronezh region	469,6 ths tons (+7,4%)
4	Udmurt republic	438,2 ths tons (+5,2%)
5	Kirov region	414,5 ths tons (+6,2%)
6	Novosibirsk region	387,1 ths tons (+5,8%)
7	Sverdlovsk region	375 ths tons (+6,3%)
8	Moscow region	365,5 ths tons (+4,9%)
9	Leningrad region	361,5 ths tons (+4,1%)
10	Altai region	349,8 ths tons (+4,7%)
11	Republic of Bashkortostan	331,9 ths tons (+5%)
12	Vologodskaya region	328,7 ths tons (+6,9%)
13	Belgorod region	319,3 ths tons (+2,1%)
14	Nizhny Novgorod region	301,5 ths tons (+4,5%)
15	Ryazan region	274,8 ths tons (+15,9%)
16	Perm region	265,8 ths tons (+5,3%)
17	Krasnoyarsk region	246,7 ths tons (+6,9%)
18	Kaluga region	236 ths tons (+13,6%)
19	Vladimir region	233,7 ths tons (+4,8%)
20	Republic of Mordovia	228,9 ths tons (+6,7%)
21	Tyumen region	222 ths tons (+4,8%)
22	Omsk region	205,3 ths tons (+1,4%)
23	Yaroslavl region	179,9 ths tons (+4,9%)
24	Lipetsk region	134,4 ths tons (+8,8%)
25	Kursk region	126,8 ths tons (+19,3%)

The imposition of a list of economic sanctions against Russia that endangers the Russian

Federation's food security, in reaction to which our nation barred the import of food items from many states into the country, provided a major impetus in the issue of increasing the competitiveness of dairy companies in the country's agro-industrial complex (EU countries, USA, etc.). As a result, the Russian Federation's import substitution program has become the country's primary long-term growth strategy.

It is necessary to emphasize the fact that the improvement and construction of the latest farms for the organization of agricultural production activities are carried out within the framework of the use of modernized resource-saving equipment, which can significantly reduce production costs for milk.

The establishment of economic sanctions specified by the President of the Russian Federation of August 6, 2014, No. 560 "On the Application of Certain Special Measures to Ensure the Security of the Russian Federation" and the Decree of the Government of the Russian Federation No. 778 of August 7, 2014 "On Measures to Implement the Decree of the President of the Russian Federation" protectionist policy and replace imported products with domestic ones in the ratio of 23% to the dairy market (FSSS, 2018).

The main measures in the framework of significant restructuring and improvement of agro-industrial complex organizations include the priority plan "Development of the agro-industrial complex" and the state program for the modernization of agricultural activities, as well as control of its markets and food products. In the conditions of these programs, agricultural enterprises are provided with special preferential conditions, for example, in investment lending. The aggregate implementation of such projects as improving technological equipment, purchasing animals with genetic potential in combination with good nutrition will affect the dynamics of growth in the volume of dairy products.

In general, this area of the agro-industrial complex is the most import-dependent on the market of provided food products.

In 2016, almost 24 billion rubles were provided for the dairy industry. That is why this period is characterized by the construction of about 50 livestock complexes, and almost 355 thousand tons of dairy products were manufactured. However, these are very small results. In order to achieve such an economic regime for the country, when it will be independent of global fluctuations, it is necessary to increase the volume of dairy products by 8-9 million tons, for which it is necessary to invest almost 655 billion rubles (Dairynews,2020).

The production of dairy products between the regions of the country is relatively even. It should be noted that there are no areas in which milk production accounts for the bulk of

the total production. More than 50% of the total volume of milk produced in the Russian Federation is calculated for a number of leading producing regions.

The total volume of manufactured dairy products for the specified period in Russia was 10,58 million tons.

It should be noted that the first position in the rating for the sale of dairy products was taken by the Republic of Tatarstan with the total volume of manufactured dairy products 731,77 ths tons (6,92% of the total volume in Russia). Over the year, the volume of sold dairy products increased by almost 5,7% - by 41,71 thousand tons (compared to the baseline in 2019), and over 3 years the volumes increased by 21,9% or by 160,17 thousand tons. Today the Republic of Tatarstan occupies the first position in the rating for milk production among the regions of Russia. However, the Republic of Tatarstan is one of the most acutely deficient regions in the industrial processing of milk. The Table 12 illustrates a list of the leading Russian milk production companies from 2017-2019 (Liton, 2021).

Table 12. The list of the leading Russian milk production companies from 2017-2019

№	The name of the company	Gross milk yield (thousand tons)			Livestock (thousand heads)	
		2019	2018	2017	Cattle	Cows (forage)
1	Group of Companies "EkoNiva"	758	484	297	183,0	95,0
2	"Agrocomplex named N.I. Tkachev"	271	264	247	107,1	36,7
3	Agricultural holding "Krasnyi Vostok"	129	122	118	71,8	27,3
4	Holding complex "Ak Bars"	125	118	115	96,0	21,6
5	APH "Doronichi"	114	95	91	23,2	12,9
6	Piskarevsky dairy plant	112	111	110	22,6	12,5

Source: Milk production in Russia: problems, prospects, statistics – Liton, 2021

A striking example of active modernization of the agro-industrial complex can be the restructuring of old dairy complexes. In the Moscow region, about 7,9 bln rubles are needed for the reconstruction of more than 120 farms. The expected result of such an investment is an increase in the livestock population by almost 46 thousand and the volume of dairy products by 284 thousand tons annually (Dairynews,2020).

Today, the main problem is the underdevelopment of the technological area in the agro-industrial complex. According to the data for 2013 and the coming years, analysts say that the volume of milk produced will decrease by almost 6% during this period, which is a significant decline. Veklenko V. argues that even if the average milk yield per unit of livestock in the regions is almost 5,5 thousand kg, this tendency will bear the character of a decline due to the dynamic decline in the livestock population every year. The author believes that the main problem of the current situation is that the country's government provides insignificant preferential terms for milk producers (Veklenko et al., 2015). That is why the dairy production of the agro-industrial complex of Russia is not competitive in relation to world countries. Also, the slow pace of development of the technical equipment of dairy complexes can be attributed to the factors influencing the volume of costs of dairy farming.

Companies working in the field of milk extraction and processing may face the following problems:

- 1) too many products are being imported. The imported goods have a lower value. This is their competitive advantage, due to which they can oust domestic dairy products from the market;
- 2) high cost of milk production in Russia. The technological base is rather weak. The low level of its development does not allow to reduce production costs without loss in the quality and quantity of manufactured products;
- 3) poor quality of raw materials due to the replacement of milk with herbal supplements;
- 4) Lack of raw materials, especially during the summer months.

Dairy farming has its own challenges:

- 1) low profitability;
- 2) dependence on natural and climatic conditions. The underdevelopment of technological processes at the moment does not allow us to cope with this problem;
- 3) long production cycle;
- 4) short duration of productive life of animals;
- 5) lack of a high-quality domestic base of livestock breeding;
- 6) reduction of acreage. This leads to a decrease in the quality of forage crops.

Thus, the weaknesses of the agro-industrial complex enterprises include the lack of competitive production complexes, including the coordination and technology of production activities, the commercial area for the material and technical equipment of the complex, the control of labor efficiency indicators, the modernization of the technologies used, the monitoring of the quality of the raw materials used, as well as analysis. quality of management, etc. The federal program for the modernization of agricultural activities and the organization of markets for food products and resources of the agro-industrial complex envisages an increase in the volume of milk sales to 38,3 million tons annually. However, the implementation of this program is conditioned by the dynamics of growth in the quality indicators of dairy products, as well as by a reduction in costs per unit of production. Optimization of breeding resources will increase the economic effect of the sale of dairy products.

5. Development of directions for increasing the efficiency of production and logistics activities in JSC “Krasnyi Vostok Agro”

5.1 Economic characteristics of JSC “Krasnyi Vostok Agro”

The JSC "Krasnyi Vostok Agro", established in the spring of 2003, is the largest agricultural company in the Republic of Tatarstan, which produces milk on the largest mega-farms of the Republic, the production of crop products on the 264000 hectares of land owned by the company, the manufacture of breeding products, as well as the production of beef and elevators with a total capacity 453 thousand tons, etc. (Annual report of Krasnyi Vostok Agro, 2019).

5 breeding organizations located in several districts of the Republic of Tatarstan and connecting about 58 livestock complexes, carrying out the following activities:

- 1) feeding livestock with high production potential and breeding bulls;
- 2) making beef.

Today, the agro-industrial complex operates in the following territories of the Republic of Tatarstan: Alkeevsky, Alekseevsky, Zelenodolsky, Verkhneuslonsky, Nurlatsky, Spassky, Rybno-Slobodsky, Kamsko-Ustinsky, as well as in Ulyanovsk and Tambov regions.

At the moment, the total number of the company's pedigree livestock is almost 66000 heads, including a dairy herd of 25500 heads, the bulk of which are located in the Republic of Tatarstan, 63000 thousand head of cattle and 22000 dairy cows.

The JSC "Krasnyi Vostok Agro" strives to modernize the existing areas of the agro-industrial complex in the Republic of Tatarstan.

Over the 14 years of operation of the company, the total amount of investments is 33 billion rubles, of which 13 billion rubles have been invested in improving the dairy farming of the agro-industrial complex, and some of the most powerful mega-farms have been built (Annual report of Krasnyi Vostok Agro, 2007-2020).

Agricultural activity is considered one of the fastest-growing areas of the Russian economy. In accordance with the statistics of the federal service, in 2015, a deficit year for Russia, this direction remained practically the only one, which reflected positive development indicators – 2,6% compared to the base year, and in 2016 – 4,9% (FSSS,2016).

The “Krasnyi Vostok Agro” is a company that pays special attention to maintaining a

competitive position and maintaining a business reputation in the republic's market. It should be noted that the joint-stock company is a part of the Agroholding "Krasnyi Vostok", is actively involved in strategic management, makes plans for the next 3 years. The company has a mission, a strategy, a corporate culture that has been in effect for many years, and its own traditions.

First of all, analyze the Krasnyi Vostok agricultural holding using the M. Porter value chain, which will reflect all the main elements of activity and competitive advantages as presented in Figure 12.

Supporting activities	<p>The infrastructure of the company (Planning, financial activities, etc.): includes centralized structural units</p> <p>Human resource management: employees must have the necessary qualifications, which means they periodically go through the retraining process, monitoring the results of the work of structural units.</p> <p>Development of technologies: search for new technological solutions to increase labor productivity, installation of foreign DeLaval equipment on mega-farms.</p> <p>Supply chain: use of own fodder base in "Krasnyi Vostok Agro"</p>				
The main activity	<p>Ensuring the supply of raw materials</p> <p>The supply of raw materials within the company is carried out continuously directly by means of transport</p>	<p>Output</p> <p>Includes dairy products, crop production, livestock breeding, grain processing and storage on 267 thousand hectares of land</p>	<p>Ensuring product sales</p> <p>Produced through an affiliated distribution network of over 60 outlets</p>	<p>Marketing and sales</p> <p>Direct and narrow sales channels</p>	<p>After-sales service</p> <p>Absent</p>

Figure 12. Value chain according to M. Porter of the agricultural holding "Krasnyi Vostok"

The mission of "Krasnyi Vostok Agro" is primarily to develop the agro-industrial complex.

The result of the analysis of the strengths and weaknesses of the company, the existing opportunities, and threats made it possible to draw up a SWOT analysis in Table 13.

Table 13. SWOT-analysis of JSC "Krasnyi Vostok Agro"

Strengths	Weaknesses
<ul style="list-style-type: none"> - Availability of able-bodied unemployed population, the possibility of attracting this category to work - Availability of support programs for the agricultural sector. - Sales markets have been organized - There are free land plots for the development and expansion of this sector 	<ul style="list-style-type: none"> - Uncompetitive conditions for the sale of products (low purchase cost of milk) - Lack of state control over dairy products coming from abroad at dumping prices and monthly import quotas - Low selling price of milk and meat

<ul style="list-style-type: none"> - Strong technical base - High quality of services 	
Threats	Opportunities
<ul style="list-style-type: none"> - Termination of subsidies - Decrease in prices for agricultural products - Dependence on natural factors - Loss of sales markets - Decrease in effective demand 	<ul style="list-style-type: none"> - Raw milk processing - Introduction of highly automated technologies that increase labor indicators - Increase in the volume of subsidies - Exit to new limits outside the Republic of Tatarstan - Professional development of personnel

As can be seen from the table, the strength of the “Krasnyi Vostok Agro” company is that the company has been on the market for dairy products for a long time and provides quality services to the population of the Republic of Tatarstan. Industrial processing of milk is carried out by another large dairy complex, which undoubtedly affects the company's profitability. That is why it is necessary to increase the efficiency of the application of state programs that will help stimulate the work of the largest mega-farms of the Republic of Tatarstan. The weaknesses also undoubtedly include competitors of the company in a similar field of activity of the agro-industrial complex, which, in one way or another, are found in the territory of the Tatarstan and beyond.

5.2 Corporate culture and incentive system in the company

The management of Krasnyi Vostok Agro JSC consists of a general director who directly controls the operation of the entire enterprise as a whole. In addition, he regulates absolutely every operation of the current work of Krasnyi Vostok Agro. The organizational structure includes structural units that perform certain operations for successful functioning. Structural links are endowed with administrative and economic responsibility, that is, they can guarantee the implementation of important regulations within the powers for each structural link by the company's management in Figure 13.

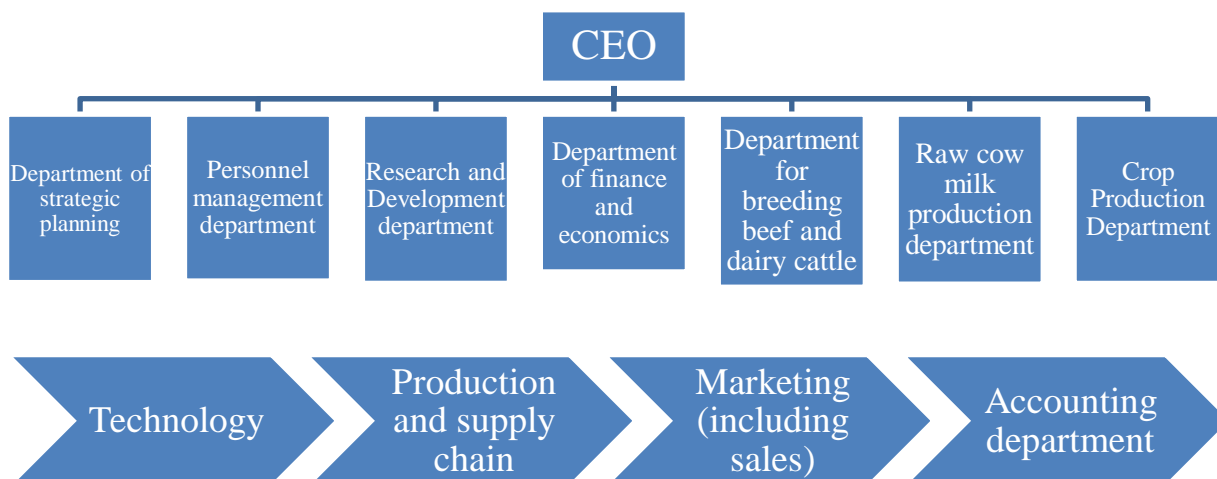


Figure 13. Value chain according to M. Porter of the agricultural holding "Krasnyi Vostok"

In a company, planning is carried out in parallel by several structural units. In addition, a significant part of the responsibilities of this function is assigned to the economic structures of the company, for example, financiers, procurement, sales, marketing, research, and development. And the process of forming the plan involves the participation of absolutely every structural division of the company: the production and technical division prepares an action plan for the modernization of the technical part, determines the technical and economic criteria for the use of production resources; the financial department reflects a plan for profit, profitability and a financial plan, in addition, it approves the range and total quantity of goods manufactured for sale and also specifies the degree of the workload of production equipment; the legal unit is responsible for the work plan. The planning process consists of the following parts:

- organization of the staffing table;
- definition of vacations and sick days.

The function of motivation as incentives for employees is carried out by the management of the joint-stock company with the help of both material and non-material incentives. For example, in "Krasnyi Vostok Agro" in practice, comprehensive methods of stimulating employees are used: economic, organizational, and administrative, social, and psychological methods. For this, there is a collective agreement, according to which each employee knows his responsibilities in the field of labor relations. It is mandatory for all employees of the company. Thus, in the framework of increasing labor productivity, the enterprise "Krasnyi Vostok Agro" needs to coordinate the work of personnel. The reduction in workers was due to a dynamic increase in variable labor costs, which, in turn, increased by 32,6% from 2010-2014. The amount of money for wages and payment of

dividends to investors was almost 552 million rubles (Annual report of Krasnyi Vostok Agro, 2007-2020).

As a rule, employees should be rewarded for achieving the set targets every month. The employee's professional qualifications deserve encouragement, as well as in case of success of the employee in the implementation of the tasks set before the company, etc. If the employee has not fulfilled his duties, has repeatedly violated labor standards that are specified in the company's Regulations, agreement, or other regulations or legislation of the Russian Federation, the head department can partially or completely deprive the employee of material incentives.

In addition, in the company "Krasnyi Vostok Agro" non-material encouragement by the management involves verbal gratitude, presentation of an honorary diploma, as well as advanced training of employees.

These methods of incentives allow company to stimulate the activities of the employee as an individual person, and not just the general system of units, whose work is aimed at achieving high-performance indicators.

As a rule, all provisions on employee wages and bonuses are specified in the corresponding document on the remuneration of employees of the Krasnyi Vostok Agro company, which is signed by the company's management.

Preliminary control in JSC "Krasnyi Vostok Agro" is directed towards the human factor. Monitoring of employees of structural divisions is carried out within the framework of testing the level of professional qualifications, as well as the possession of the required experience in the specialty and interviews with a candidate.

The current control of "Krasnyi Vostok Agro" is carried out by assessing the actual indicators achieved after the sale of dairy products, the purpose of which is to obtain the desired results. That is why, the management determined such a feedback procedure, in which employees of lower levels informed managers about emergency situations, thereby could influence possible deviations of the company from the correct direction of achieving the goal. In this case, deviations may appear due to the influence of both the external environment of the company (competitors, the influence of economic circumstances, changes in the laws of the country, etc.) and the internal one.

The main control takes place in the context of interaction between management and employees of structural divisions after the immediate implementation of the assigned tasks, while the managers of these divisions provide reports on the results achieved. This management function helps company managers to obtain the necessary data and stimulates

employees to work more efficiently.

5.3 Determination of financial stability

To carry out the economic characteristics of JSC "Krasnyi Vostok Agro", consider the company's balance sheet of forms No. 1 and No. 2 and conduct a factor analysis of the profit from sales as it illustrated in Table 14.

Table 14. Initial data for the analysis of the statement of financial results of JSC "Krasnyi Vostok Agro", thousand rubles

Indicator	Reporting period (2019)	Base year (2018)	$\Delta \mp$	Level to revenue in the reporting period (%)	Level to basis revenue (%)	$\Delta \mp$ Levels
Revenue	3337601	3210903	-126698	100	100	0
Cost of sales	3338867	3444446	-105579	100,04	107,27	-7,23
Distribution costs	-	-	-	-	-	-
Administrative expense	-	-	-	-	-	-
Profit (loss) from operating activities	183091	213531	-30440	0,054	0,066	-0,012

Source: balance sheet of JSC "Krasnyi Vostok Agro" for 2018-2019

1) First of all, calculate the influence of the sales revenue factor.

Before conducting the analysis, calculate the company's revenue in comparable prices, taking into account the inflation factor. Inflation for the reporting period was 3%, for the base period – 4,2%

$$\Delta R_{cp} = \frac{R_1}{I} = \frac{3337601}{1,03} = 3240389,32 \quad (5.1),$$

where ΔR_{cp} – revenue proceeds in comparable prices;

R_1 – revenue of the reporting period;

I – price index;

$$\Delta R_p = R_1 - \Delta R_{cp} = 3337601 - 3240389,32 = 97211,68 \quad (5.2),$$

where ΔR_p – the change in revenue due to the price factor;

R_1 – revenue of the reporting period;

ΔR_{cp} – sales proceeds in comparable prices.

Due to the increase in prices, the proceeds increased by 97211,68 thousand rubles

$$\Delta Rv = \Delta Rcp - R0 = 3240389,32 - 3210903 = 29486,32 \quad (5.3),$$

where ΔRv – the change in revenue due to the volume factor;

ΔRcp – revenue proceeds in comparable prices;

$R0$ – the base period revenue.

Due to an increase in the volume of products sold, the proceeds increased by 29486,32 thousand rubles.

1.1) Calculation the influence of the price factor on the profit from sales

$$\Delta Pp = \frac{\Delta Rp \times R0pr}{100} = \frac{97211,68 \times 0,066}{100} = 64,16 \quad (5.4),$$

where ΔPp – the change in the profit price;

ΔRp – the change in revenue due to the price factor;

$R0pr$ – the level of revenue in% for the reference period.

Thus, the increase in prices for products in the reporting period compared to the baseline led to an increase in the amount of profit from sales by 64,16 thousand rubles.

1.2) Calculation the influence of the factor (the number of products sold) on the profit from sales

$$\Delta Pv = \frac{(\Delta Rcp - R0) \times R0pr}{100} = \frac{(3240389,32 - 3210903) \times 0,066}{100} = 19,461 \quad (5.5),$$

where ΔPv is the effect of the number of products sold on profit;

ΔRcp – sales proceeds in comparable prices;

$R0$ – revenue of the base period;

$R0pr$ – the level of revenue in% for the reference period.

Thus, as a result of the increase in the number of products sold, the profit from sales increased by 19,46 thousand rubles.

2) Calculation the influence of the factor of the production cost

$$\Delta Pc = \frac{-1 \times R1 \times \Delta C}{100} = \frac{-1 \times 3337601 \times (-7,23)}{100} = 241308,55 \quad (5.6),$$

where ΔP_c is the change in profit from cost;

R1 – revenue of the reporting period;

ΔC – deviation of cost levels in%.

The cost of production in the reporting period decreased by -105,579 thousand rubles, its level in relation to revenue decreased by 7,23%. The profit indicator increased by 241308,55 thousand rubles due to a slight change in the cost of production.

Combine all the factors in the analytical Table 15.

Table 15. Analytical table of the considered factors

Factor name	The degree of influence of the factor on the profit from sales (thousand rubles)
Increase in sales prices	Has led to an increase in the amount of profit from sales by +64,16 (thousand rubles)
Increase in the number of products sold	Has led to an increase in profit from sales by 19,461 (thousand rubles)
Reducing production costs	Has led to an increase in the amount of profit from sales by +241308,55 (thousand rubles)
Increase in selling expenses	-
Increase in management costs	-

According to factor analysis based on the balance sheet of JSC "Krasnyi Vostok Agro", it can be concluded that the increase in profit from sales was provided by the cumulative influence of external and internal factors.

The increase in the volume of products sold, which was reflected in the revenue, had a positive impact on the sales profit. In these conditions, the volume of products sold requires a more thorough study and analysis, and to increase sales, company also need to pay attention to marketing tools.

Also, to assess the change in indicators, it's reasonable to use the horizontal and vertical analysis methods. To do this, draw up the following table according to the company's balance sheet in Table 16.

Table 16. Analytical table

Indicator name	Reporting period data (2019)	Base year data (2018)	$\Delta \mp$	%
Asset balance	11321581	12126690	-805109	-6,64
Total for section 1 (non-current assets)	9060673	8730421	+330252	+3,78
Total for section 2 (current assets)	2260908	3396269	-1135361	-33,43

According to the table, the company's asset balance decreased by 6,64%, mainly due to a decrease in current assets by 33,4%.

The explanation for the decrease in current assets is evidenced by the fact of a decrease in

inventories, accounts receivable and cash assets of the enterprise.

For a deeper analysis, analyze the section 1 non-current assets, the increase in indicators was mainly influenced by an increase in fixed assets by 328881 thousand rubles, as well as other non-current assets by 1371 thousand rubles, which indicates the financial activity of the enterprise.

In section 2 of the asset of the balance sheet, the main indicators that influenced the balance of the asset are considered, this is a decrease in inventories by 709936 thousand rubles, as well as a decrease in accounts receivable by 513614 thousand rubles. The reduction in receivables indicates that the problems in sales with deferred payments of customers are gradually being resolved, since a significant excess of receivables threatens the financial stability of the organization and makes it necessary to attract additional sources of financing. Therefore, it is necessary to carefully analyze customers and create more accurate payment terms.

Also, consider the balance liabilities. There is a decrease in long-term liabilities mainly due to a decrease in other long-term liabilities by 444536 thousand rubles.

Short-term liabilities decreased by 273,924 thousand rubles mainly due to a decrease in borrowed funds by 714854 thousand rubles. This fact implies the solvency of the organization and assumes that the company has sufficient financial resources to carry out its activities competently. However, there is a sharp increase in accounts payable.

The Table 16 shows an analysis of the profitability of the enterprise, which made it possible to draw the following conclusion: In 2019, JSC "Krasnyi Vostok Agro" received a loss in the amount of - <0,1 kopecks from each ruble of sales proceeds in the main type of activity. Moreover, it is important to note that the drop in the profitability of ordinary activities in comparison with this indicator for the period 01.01–31.12.2012 amounted to -0,2 kopecks.

Profitability, calculated as the ratio of profit before tax and interest expense (EBIT) to the company's revenue, for the last year was 5,5% in Table 17.

Analyzing the liquidity of JSC "Krasnyi Vostok Agro" as it presented in Table 18.

To determine the balance of the balance, it is necessary to compare the results of the assets and liabilities conducted.

Table 17. Analysis of profitability of JSC "Krasnyi Vostok Agro" for 2012-2019 y.

Profitability indicators	Indicator values (in%, or in kopecks per ruble)								Change in indicator	
	2012 y.	2013 y.	2014 y.	2015 y.	2016 y.	2017 y.	2018 y.	2019 y.	k., (c.9 - c.2)	± % ((9- 2)*2)
1	2	3	4	5	6	7	8	9	10	11
1. Profitability of sales. Normal value for the industry: at least 9%.	0,2	0,5	0,4	0,9	0,6	0,9	-7,3	-<0,1	-0,2	↓
2 Profitability of sales by EBIT	27,3	26,4	18,2	16,7	15,5	9,8	6,7	5,5	-21,8	-79,8
3. Profitability of sales in terms of net profit. Normal value for the industry: at least 6%.	0,3	0,5	0,4	0,5	0,7	0,8	1,5	1,4	+1,1	+4,2
Interest coverage ratio (ICR), coeff. Normal value: 1.5 or more.	1	1	1	1	1	1,1	1,3	1,3	+0,3	+32

The balance is considered absolutely liquid if the following conditions are performed

$$A1 \geq L1;$$

$$A2 \geq L2;$$

$$A3 \geq L3;$$

$$A4 \leq L4.$$

Table 18. Analysis of liquidity of JSC "Krasnyi Vostok Agro" for 2019

Assets	At the end of the period	Growth for the analyzed period, %	Liabilities	At the end of the period	Growth for the analyzed period, %	Surplus/Lack of payment means
A1	64661	-95,8	L1	2172362	+35,4	-2107701
A2	1218850	-38,9	L2	993289	-22,4	+225561
A3	977397	-41,5	L3	2416965	-70,2	-1439568
A4	9060673	-26,6	L4	5738965	-12,2	+3321708

According to the calculated table, the conditions are not performed. Thus, it can be concluded that:

- according to factor analysis, there was an increase in profit from sales, which was provided by various factors: an increase in the volume of products sold, which contributed to a change in revenue, had a positive effect on profit from sales, therefore, the volume of products sold requires even more careful analysis for further growth, and to increase sales

need to use marketing tools;

- the balance sheet of the company's assets decreased by 6,64%, mainly due to a decrease in current assets by 33,43%;

- there is a decrease in long-term liabilities mainly due to a decrease in other borrowed funds by 444536 thousand rubles.

Results of the four ratios that characterize the ratio of assets in terms of liquidity and liabilities in terms of maturity, only one is fulfilled. JSC "Krasnyi Vostok Agro" does not have enough cash and short-term financial investments (highly liquid assets) to pay off the most urgent liabilities (the difference is 2107701 thousand rubles). In accordance with the principles of the optimal structure of assets by the degree of liquidity, short-term receivables should be sufficient to cover medium-term liabilities (L2). In this case, the organization has enough quick-to-sell assets to fully repay medium-term liabilities (up 22,7%).

5.4 Analysis of the main indicators of production and logistics activities of JSC "Krasnyi Vostok Agro"

For many years, it has been holding the lead in the Republic of Tatarstan agricultural producers that have strong positions in the Tatarstan market.

Definitely, JSC "Krasnyi Vostok Agro" has its own advantages and disadvantages. The advantages were presented in the previous chapter, consider and analyze the weaknesses of the company.

Total for 2019 revenue from the sale of goods amounted to 3337601 thousand rubles. The cost of goods sold in 2019 according to the system 3338867 thousand rubles. The difference is 1266 thousand rubles.

Analyze the initial data of the company JSC "Krasnyi Vostok Agro" for the analysis of indicators in Table 19.

In line with plans for 2018, the company planned to increase its milk production figures by 17%. For this, about 3250 heads were purchased in Denmark, Hungary, etc. By the end of the year, the total number of purchased livestock will be 5400 heads.

Table 19. Dynamics of the number of cows, their productivity and volume milk production in JSC "Krasnyi Vostok Agro"

Indicator name	Agricultural production	
	2019	2018
Gross milk yield, centners	989756	966518
Milk yield per cow, kg	5766	5563
Selling price of 1 centner of milk, rub	1934	1774
Offspring and livestock growth, centners	16731	14726

In accordance with the analysis of the company and its structure, it is safe to say that a significant problem in JSC "Krasnyi Vostok Agro" is the difference in the proceeds from the products sold and its production cost. The discrepancy in the volume of sales is explained by the fact that the cost of goods sold in terms of cattle is formed from the costs of several years (according to the specifics of activities in agriculture, the process of producing finished products is stretched over several reporting periods). In other words, the cost of goods sold reflects the costs for the entire period of raising the sold cattle from the moment of obtaining the offspring until the moment of sale. Despite this, the company is developing and is doing everything possible to get out of problem situations.

The object of logistic analysis in the company is, of course, the material flow. Research of commodity circulation in JSC "Krasnyi Vostok Agro" showed the following characteristics:

- the specificity of the material flow, which manifests itself in the speed of the expiration date, as well as the requirements for its storage;
- the elements of commodity circulation, are significantly transformed in the process reaching the end consumer;
- commodity movement of products to the final subject of consumption affects the expansion of the range (in this case, from milk processing enterprises) in Figure 14.

In JSC "Krasnyi Vostok Agro" logistics activities are used for functional planning in the company. A specialized logistics department is provided here, which organizes the movement of goods, the acquisition of the moment of livestock before the sale to processing enterprises. The responsibilities of the logistics department are transport logistics, material and technical supply of products, as well as warehouse management.

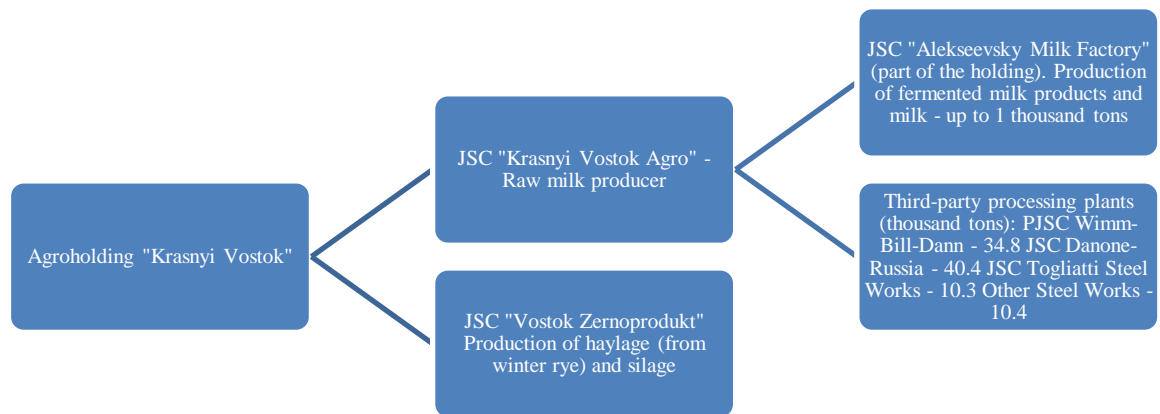


Figure 14. The structure of the agricultural holding "Krasnyi Vostok"

"Alekseevsky Dairy Plant", like "Krasnyi Vostok Agro", is part of the "Krasnyi Vostok" agricultural holding and carries out industrial processing of raw milk. The range of manufactured products includes fermented milk products and milk. Nevertheless, the maximum volume of raw milk that "Krasnyi Vostok Agro" company can ship for processing is up to 1000 tons. The rest of the products are distributed between third-party dairy plants as follows, as shown in the Table 20:

Table 20. The volume of sold raw milk of JSC "Krasnyi Vostok Agro" for 2019 y. (according to balance sheet 2019 of JSC "Krasnyi Vostok Agro")

Dairy factories	Volume of products sold by JSC "Krasnyi Vostok Agro", thousand tons
Wimm-bill-dunn	34,6
Danone	40,3
Togliatti Dairy Plant	10,1
Other dairy factories (including Alekseevskiy dairy plant)	11,2

As a result, the main tasks of production logistics include:

- organization and dispatching of the production process using the sales forecast;
- drawing up a schedule for the manufacture of dairy products, which will be coordinated with each structural unit of "Krasnyi Vostok Agro" company;
- determination of the unfinished production standard and control over its observance;

- operational management of the production process and monitoring of the execution of the production business process;
- control over the cost of finished products.

Sales logistics activities of the company are:

- analysis of market conditions and identification of the leading rivals in the dairy industry;
- organization of the chain of the material flow of milk;
- development of a logistics infrastructure to guarantee the sale of products on time, of the required quality and volume;
- increasing the value of goods due to the production of only quality goods;
- optimization of costs in logistics links, as well as rational pricing of products.

5.5 View on disruptive innovations and impactful changes in the company

In the course of the study, it was established that the agricultural holding every year expands its geography of production and financial activities in the territory of the Republic of Tatarstan and increases production capacity, which complicates the logistics structure, and the amount of accounting and analytical information necessary for making management decisions grows. In addition, the careful implementation of the logistics approach is reflected in the gradual development of management processes, the use of automation systems as part of the centralization of structural divisions and links of commodity distribution, which affects the increase in the level of productivity of the agro-industrial complex for milk production.

As previously reported, the technology revolution in a company is a long and complex phase that requires careful preparation and phased execution. At all levels of the digital transition, the goal must be set in such a way that it has an immediate impact on the company's key success metrics. The progression of integrating the value-oriented stages of supply chain digitalization, as shown in Figure 15, should ensure that the results of each series of initiatives implemented in that stage can be accessed, analyzed and adapted to provide the company with the greatest potential benefits.

Each stage should be based on the previous one and describe the characteristics and tools needed to achieve it. The following sequence of value-oriented stages of the implementation of a plan for the digitalization of the logistics activity takes into account the interconnectedness of the measures for the implementation of the main digital technologies. In accordance with the analysis of the company's activities, it's easy to say that today it is at the 1st stage – Informatization.

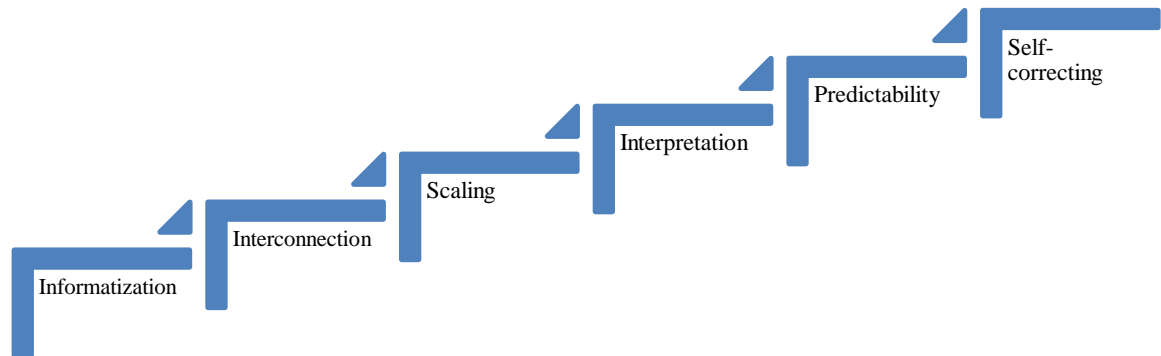


Figure 15. The main stages of the digitalization of "Krasnyi Vostok Agro"'s logistics activities

Stage №1. Informatization - the use of specialized technologies to address logistics management issues, mainly focused on individual logistics functions:

- transportation - geolocation systems to control the duration of the order cycle;
- warehousing - robotic systems, WMS-systems for controlling product flows through the warehouse, warehouse resource management and others. The informatization is the foundation of digitalization, the characteristic feature of which is incomplete automation and informatization.

Stage №2. Interconnection - the interconnectedness of ubiquitous business add-ons for problem solving and management decision-making - WMS, TMS, inventory management, logistics process management, etc. modules in the structure of an entire corporate information system of ERP class.

Given the use of linking modules within a single information system, the absolute integration of these information and operational technologies has not been achieved. It is necessary to continue to implement the Internet protocol IPv6, which allows to connect all components of the system for common data exchange, which is a key requirement for the IoT.

Stage №3. Creating a digital model of the company's supply chain, which replicates the characteristics of logistics processes in real time.

This stage is implemented by increasing the data entry points (sensors, RFID tags), which record the actions and position of most of the associated objects in real time during the entire flow path through the entire logistics system of the enterprise. Such an approach will guarantee more effective management decisions, based on real and relevant data, and also actualizes the tasks of providing a single source of reliable data and providing corporate rights to obtain it. Integration of all systems and applications in use is necessary, which guarantees a true picture of the current state of affairs based on a single source of reliable data available to the entire enterprise.

Stage №4. Interpretation is the establishment and deciphering of signals and relationships in a digital model for further difficult management decisions, mainly in the management of coupled or integrated business processes in supply chains. In order to identify and interpret relationships in a digital model of a logistics system, the acquired information must be analyzed through the application of technical knowledge.

Thus, semantic linking, aggregation and exploration of large amounts of information and appropriate contextualization guarantee complete process knowledge, which is necessary for making fast and correct management decisions. Implementation of this step requires processing of often heterogeneous information sets, which can be analyzed with the help of common platforms based on Big Data technology.

Stage №5. Predictability - the assumption of possible scenarios of development of business processes of the logistics system within the framework of the developed solutions using the means of big data analysis. Development of preventive measures to overcome possible tipping points in the logistics system, detected as a result of scenario predictions, using the potential of artificial intelligence. After the implementation of this stage, the digital model of the company's logistics system becomes more predictable, allowing it to immediately respond to any changes and make the necessary adjustments to the pre-created plan without wasting time and resources.

Stage №6. Self-adjustment - making decisions to adjust the state of the logistics system, correcting the deviation of the system or its element without human involvement. Flexibility, predictability and adaptability allow an enterprise to transfer the responsibility for making certain decisions to information systems based on artificial intelligence and machine learning. The criterion of successful implementation of these technologies is making decisions that bring the best results in the shortest possible time without human intervention

At the mega-farms of "Krasnyi Vostok Agro" modern system of rapid milk cooling is used. Rapid cooling from + 37 ° C to + 4 ° C is critical to maintaining high milk quality. When

leaving the udder after milking, the milk retains its natural resistance to microorganisms and only rapid cooling can prevent or minimize their further growth.

Dairy complexes are designed taking into account the physiological needs of animals, the characteristics of the herd, providing the most favorable and comfortable conditions for keeping. Used high-strength, anti-slip floor coverings, hygienic wall coverings. The general system of manure removal allows to preserve the biochemical value of the manure and use it as fertilizer. For the timely removal of manure, automatic scraper conveyors are used. From the barns, manure goes into specially built manure lagoons, isolated with a dense film, which by 100% excludes the ingress of manure into the soil, reduces the risk of pollution of rivers, lakes, and groundwater. In addition, timely manure removal improves the microclimate in the barns, since the level of ammonia and nitrogenous gases in the air decreases.

As a rule, the financial results of a company are mainly subject to the intensity of production activities. The main methods of increasing production capacity in the company are the use of not only resource-saving machinery but also the use of proven crop rotations, the development of seed production and breeding culture in the agro-industrial complex, the acquisition of only high-yielding, fertile plant varieties with a high potential for livestock production, the introduction of the necessary norms of mineral and organic fertilizers, herbicides and other types, stabilization of the forage base, etc.

The company replaces the lack of material resources by using resource-saving equipment at mega-farms. According to the company's statistics, the introduction of resource-saving equipment increased labor productivity by 1,7-2 times, and also reduced fuel and other resource consumption by almost 27-30%, and the unit cost of dairy products by 36.5-40% (kvagro.ru,2018).

The milking parlors are fully automated with the equipment of the Swedish company DeLaval. The automatic system allows milking installations to be flushed after each milking and to perform functions such as water temperature, detergent temperature, flushing duration. Modern milk meters, milk yield indicators, disposable filters, milk collectors, vacuum installations are used. The system of milk pipelines allows to completely avoid contact with the external environment at all stages of milking.

To improve production efficiency at all stages of the production process, "KV Agro" company needs to develop the digital supply chain and connect it with logistic management methods.

6. New digital supply chain

6.1 Trade network creation

Today, the leading companies in the raw milk production market in the Republic of Tatarstan are "Krasnyi Vostok Agro", LLC "Ak Bars", "Agrosila", "Food Program". Mutually coordinated activities of milk producers and industrial processors should be aimed at achieving the required level of financial performance, as well as maintaining price parity, taking into account the current costs of production and processing of dairy products. As a result, purchase prices for raw milk and selling prices for whole milk products in retail chains should be established, taking into account the financial interests of the entire chain of the product's life cycle.

In such conditions, the population, farmers, and agricultural enterprises will have a real interest in increasing additional volumes of milk production, improving its quality, and reducing the cost, which will affect the efficiency of the functioning of commodity producers.

The digitalization plan of logistics activities in the production of dairy products of the company will allow uniting agricultural enterprises, processing enterprises, trade, and public catering in order to create organizational, economic, and legal conditions to meet consumer demand based on the development of market relations in the field of production, processing, and trade, which will significantly simplify the process of selling products may affect the increase in income and profitability of production. The cooperation of "Krasnyi Vostok Agro" with milk processors made it possible to improve the quality of raw materials and form an effective payment system for all links in the chain "production - processing - sale".

However, in the case of developing a plan for digitalization the supply chain in order to increase the competitiveness of products and the company as a whole by gaining competitive advantages, the best method is proposed by M. Porter (within the framework of the theory of competitive advantages) - the value chain (or value increment). The purpose of this method is to link all the key elements of the activity in order to reduce costs and increase productivity. In this case, advantages can be achieved both by reducing the costs of individual elements of the chain and by reconfiguring the entire value chain, as shown in Figure 16.

Supporting activities	The infrastructure of the company (planning, financial activities, etc.): the infrastructure of JSC "Krasnyi Vostok Agro" includes structural departments for budgeting, own audit departments, as well as departments of veterinary medicine, animal husbandry, agriculture, mechanization. Human resource management: a small number of highly qualified personnel serving highly automated lines. Development of technologies: automated equipment for milk production with high production capacity "DeLaval" is used, storage of perishable products by means of pasteurization. Supply chain: use of the food supply of the UK, availability of veterinary services				
The main activity	Ensuring the supply of raw materials It is carried out within the holding continuously by transporting raw materials from farms and lands within the holding (64 enterprises) directly to processing companies using vehicles	Output The products are manufactured at 12 livestock complexes, 14 farms and include the manufacture of breeding products, beef.	Ensuring product sales Produced with the help of Krasnyi Vostok's own sales network, as well as with the help of dealers.	Marketing and sales Increase in milk supplies at a high market price and saturation of the RT market with dairy products through direct sales channels	After-sales service Absent

Figure 16. Value chain according to M. Porter of the agricultural holding "Krasnyi Vostok Agro"

The M.Porter value chain makes it possible to combine all the main elements of "Krasnyi Vostok Agro's" activities at once, as well as significantly reduce costs and take a competitive position in the food market. In this regard, competitive advantages can be achieved in conditions of cost reduction in individual links of the chain, and when reconfiguring the entire value chain.

In my opinion, this analysis of the company allowed us to specifically consider the stages of the implementation of the value chain, determine its competitive advantages, and also reflect the interaction of the company's production and logistics activities.

6.2 Ways to improve Supply Chain Automation according to the survey results

Basis for the development of strategic alternatives, as well as possible options for a plan for digitalization of the supply chain, was formed by a survey of several structural divisions and interview with the CEO of the company. Structure of the survey is presented in Appendix 2.

During the analysis of the company's logistics, it was important to conduct a survey to find out whether the company is ready to continue to implement the plan for digitalization of the supply chain, as well as what practices have already been implemented in the company.

A survey in the form of Google was developed and sent to all employees directly or indirectly related to the logistics department. The responses were collected during the working week: from April 26 to April 30. Employees of the company from different regions of the Republic of Tatarstan took part in the survey. The total number of respondents was 19 people. The study involved 69% of men and 31% of women. This includes top and middle-managers, employees associated with the company's supply chain and production department. The survey consisted of a small number of questions, so the number of those who passed the survey was higher.

In the first question, it was asked to assess how important the principles of sustainable development are in making decisions in the field of digital supply chain management? Rate from 1 to 10. The results showed that 44% of respondents believe that they are more important than not and rated them at 5-6 points. Thus, it confirms the fact that employees recognize the importance of activities and actions to create a sustainable supply chain.

The survey also included the following question: Do you think the topic of building a sustainable digital supply chain for “Krasnyi Vostok Agro” is relevant? Answers: Yes / No. About 78% of respondents answered that logistics in the company plays a very important role primarily due to the fact (next question in the survey) that raw milk must be transported quickly and at the required temperature, otherwise the main product of the company will be spoiled.

What factors determined its relevance? The CEO of “Krasnyi Vostok Agro” answers this question as follows: "To date, the company has developed and is successfully applying a unified strategy for sustainable development. Digitalization of the supply chain will contribute to the development of the company's distribution networks, which, in turn, will affect the value chain of goods." ... That is why building a sustainable digital supply chain is relevant for Russia, even taking into account the fact that this topic is just beginning to develop here.

What are the further actions in this department of the company and what areas for development do you highlight as priorities? More than half of the responses (including top-managers) were due to the fact that the company now has one main task - to redistribute the load on farms and identify possible ways of their development to optimize the costs of purchasing and delivering raw materials and finished products to its contractors. In addition, it is very important to assess the potential for reducing logistics costs within the existing infrastructure by using innovative equipment that can significantly reduce working hours, for example.

What initiatives in the field of digitalization of DSC, typical for Russia, have already been

implemented in the company?

In a broad sense, the company uses international experience in the field of digitalization of the agro-industry in the implementation of certain initiatives, since Russia is a country integrated into the international community. But there is also its own specificity, which the company cannot but take into account. In developed countries, contractors, firstly, have large production capacities and have passed the necessary certification, and secondly, milk processing enterprises are located close to mega-farms. In Russia, the complexity of operations for any business is incomparably higher. Therefore, in Russia, the company followed this path together with its contractors: they introduced ISO standards in their production, supported the same initiatives with them.

In addition, the implementation of new initiatives (for example, replacing milking parlors with prototypes of German ones) requires joint investments - this is a difficult task in Russia. At the same time, the agroindustry is growing at a significant pace: the company has unambiguous growth in its main areas (Financial report, 2016-2019). Hence, even more, powerful production capacity and efficient/sustainable supply chain operations are required. The creation of value and quality raw materials for the client, according to the CEO, is the main task of the company.

Next step is to consider the data on the sale of milk by JSC "Krasnyi Vostok Agro", the marketability of which is 93%, in accordance with each enterprise engaged in the industrial processing of dairy products, presented in Figure 17.

Since the goods produced by the company have such a feature as seasonality in the dairy market, in the summer, with the release of dairy cattle to pastures and an increase in milk yield, dairies set lower purchase prices, and in winter, when milk production falls, they slightly increase, but the average annual cost is 27,5 rubles per liter does not compensate producers for lost profits. Whereas finished dairy products are sold in retail chains with a markup of more than 100-150% and average 55 rubles, and high-margin products have a markup of more than 200% (Zasedova, 2007).

If the company expands the list of finished products for the buyer, the cost recovery will depend on the volume of products sold to retail chains. According to the company, for 2019 the gross milk yield of raw milk amounted to 98975,6 tons, which brought the company more than 3 billion rubles, processed milk could bring almost 4,72 billion rubles of total profit in Table 21.

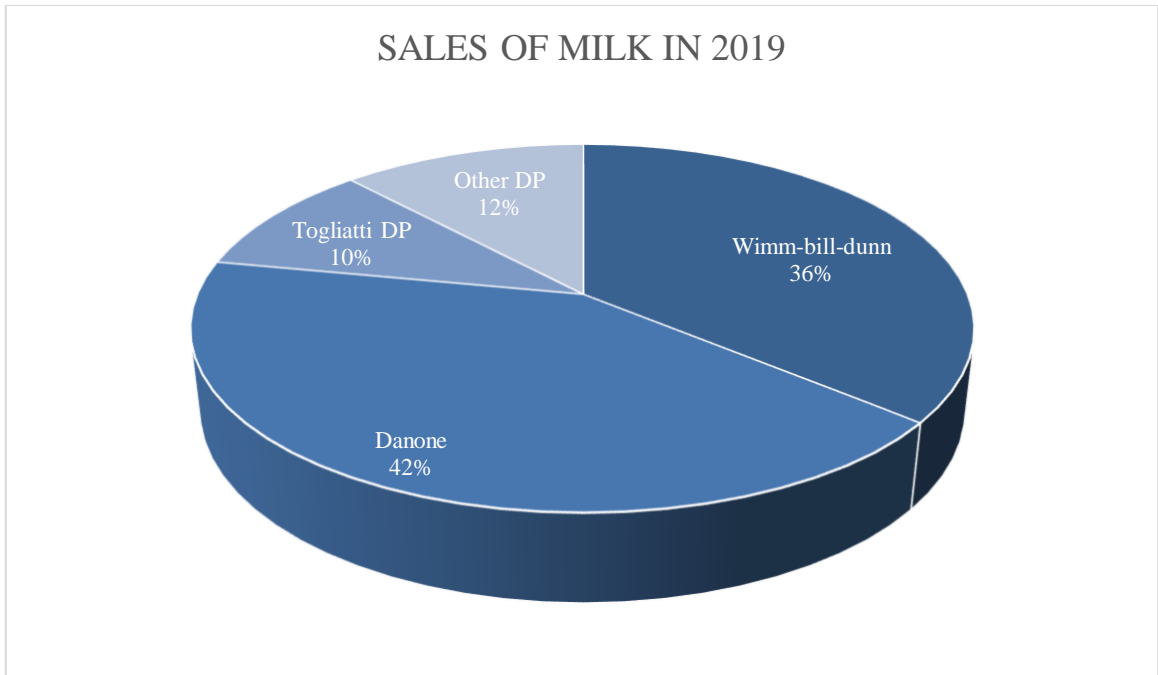


Figure 17. The volume of sold raw milk of JSC "Krasnyi Vostok Agro"

From which it follows that the “Krasnyi Vostok Agro” company loses almost half of its profits due to the absence of a processing dairy plant in Figure 18.

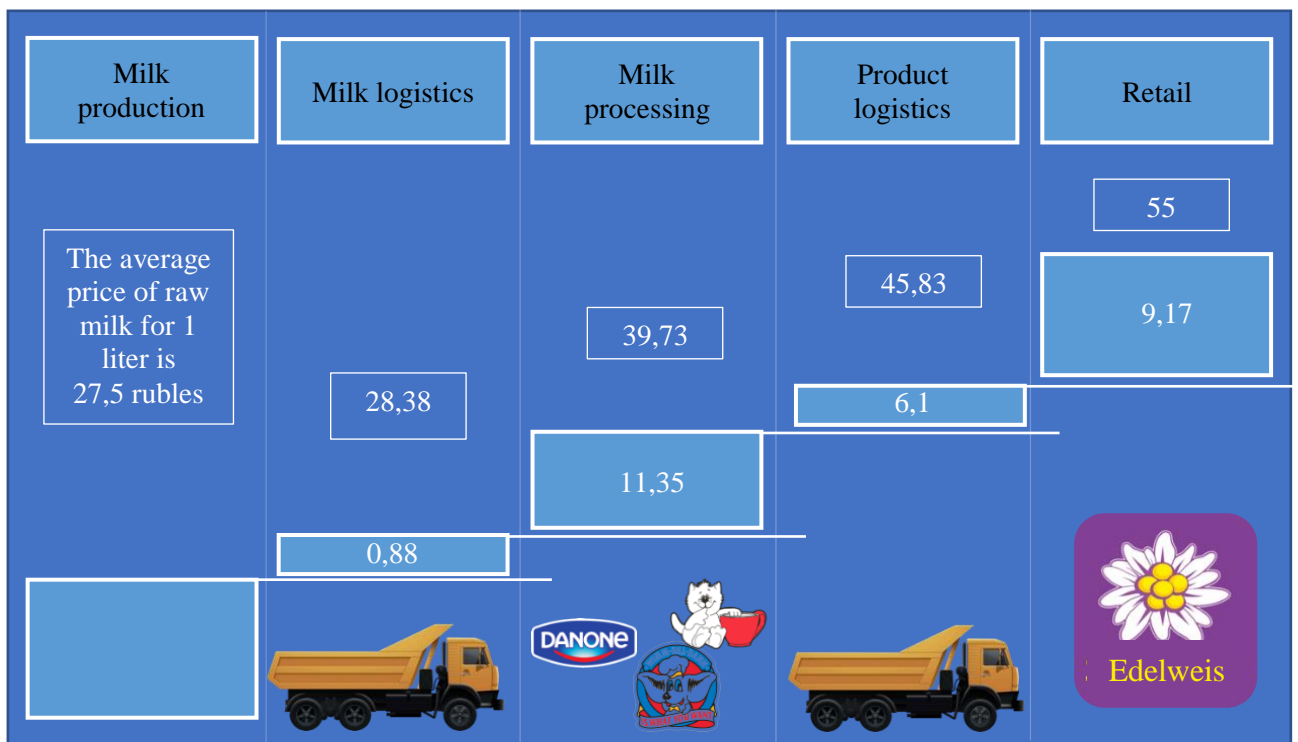


Figure 18. Distribution of value added and profit for milk

The profitability of the JSC “Krasnyi Vostok Agro” dairy product is 0,9, from which it follows that the prime cost of raw milk at existing dairy complexes is not able to cover the price of raw milk, and affects the decrease in production volumes and livestock.

Table 21. Milk pricing at different stages of the life cycle

Indicator	Milk
The original price of the item	27,5 rubles
Processing margin	40%
Taxes	6%
Markup of intermediaries and retail	22%
Final product price	55 rubles

The creation of a milk processing facility that will comply with all the standards of the sanitary and epidemiological service, as well as the introduction of equipped modular structures into production, will allow the company to easily manage material flows and have a direct channel for selling products to wholesale networks.

Reducing the cost of raw milk production can be considered as another strategic alternative to increasing the company's production and logistics activities. For example, the cost of 1 liter of raw milk consists of 49% of the cost of purchasing feed and other components of the cow's ration. Today, "Krasnyi Vostok Agro" does not have its own land pastures, where it would be possible to produce feed that is not inferior in quality to foreign counterparts. The company purchases haylage and silage for 860 rubles per ton and 560 rubles per ton, respectively, from "Vostok Zernoprodukt", a subsidiary of "Krasnyi Vostok" agricultural holding.

The production of additional compound feed for sale to third-party companies involves the implementation of basic and auxiliary operations. The first, as a rule, include processes that are directly related to the processing of raw materials into compound feed. The auxiliary ones do not imply direct interaction with the production of feed. They include transportation, reception, and storage of raw materials/compound feed. JSC "Krasnyi Vostok Agro" can additionally produce melons, barley or cake, etc. Thus, the company will be able to increase its gross margin and reduce the cost of logistics and the purchase of feed for cows.

6.3 Assessment of the economic efficiency of promising areas of increasing production and logistics activities of JSC "Krasnyi Vostok Agro"

The main objectives for this study within the agro-industrial complex are: redistribution of the load on mega-farms and identification of possible ways of their development to optimize the costs of purchasing and delivering raw materials and finished products. It was also necessary to assess the potential for reducing logistics costs within the existing infrastructure through the introduction of digital equipment and IT methods, as well as the automation of logistics business processes. Developing a digital twin of supply chains from farms and factories to the end consumer will achieve all of the above. Based on this mathematical model, try to analyze the determination of the levers for reducing the total production and logistics costs using the method of calculating the effectiveness of strategic alternatives. The informatization stage is the basis of digitalization, the distinguishing feature of which is partial automation and informatization - various information systems and technologies are used fragmentarily and disparately in separate phases of the logistics process without connection between them. Thus, this paper considers several strategic alternatives for digitalization a company's supply chain.

According to the annual financial report the volume of labor costs in a company is almost 23% of total costs. Analyzing of the logistics structure and survey illustrates that the amount of logistics costs can be reduced within the framework of the introduction of additional automated equipment, which implies a complete reconstruction of milking parlors of mega-farms with the installation of automatic milking equipment, as well as the purchase of self-loading feed dispensers. The introduction of this machine equipment will significantly affect financial costs due to the use of progressive resource-saving technologies, as well as automatic control of the modes of execution of certain operational works. In addition, the use of multifunctional feed dispensers-grinders (instead of stationary feed shops), which are widely introduced on foreign farms, suggests that labor costs are almost halved and the range of necessary equipment for feeding pedigree cattle is reduced by 2,3 times in Table 22.

Milking equipment includes automated milking equipment and an electronic milk yield accounting system, stops the work of stations after milk flow, and also automatically sends all data on livestock and milk yield to the automated herd management system, breeding, and management programs. This system excludes the possibility of "dry" milking of cows, mastitis and allows the company "Krasnyi Vostok Agro" to increase the period of productive use of cows up to 4 calvings.

Table 22. Cost of equipment for JSC "Krasnyi Vostok Agro"

Equipment	Cost, rubles apiece
Tractor feed dispenser KT-6	290000
Feed dispenser KT-10	375000
Mixer-feeder Trioliet Solomix 1 10ZK (stir and grind)	1646893
Feed mixers 1-screw OptiFEED UNO (SAMASH) (chopper + feed dispenser)	<u>1800500</u>

Source: compiled by the author according to the analysis of market equipment prices

Another fundamental criterion for increasing the efficiency of production logistics is a high feed yield due to the production of balanced feed rations that are uniform in the degree of grinding and mixing, when using which, feed losses are eliminated and the productivity of animals increases by 9-13% in comparison with separate feeding of the components of the ration. The initial investment in this project will amount to 36010000 rubles, subject to the purchase of equipment with a mixing chamber volume of 24 cubic meters and a maximum mixer load of 10000 kg in an amount of 20 pcs.

Since at the moment "Alekseevsky" dairy plant manufactures only fermented milk products and milk, "Krasnyi Vostok Agro" can expand its area of activity and start producing yogurts, hard cheeses, and curd cheeses, which are also in high demand on the market of the goods offered. The total investment in this strategically important project will be 50 million rubles. The experience of domestic companies shows that the profitability of this project is estimated at almost 42%, and the investments pay off within 3,5-4 years of the operation of the dairy plant (Veklenko et al., 2015). Necessary requirements for the implementation of processing equipment at the DP in the Table 23.

Table 23. Basic requirements for processing raw milk on equipment

Raw material:	Raw milk
Performance:	500/1000 liters
Finished products:	Yogurt, white cheese, curds
Production area:	400 sq.m.
Staff:	10-15 people

Source: compiled by the author according to the analysis of the technical characteristics of the equipment

Undoubtedly, the result of the digitalization of logistics activities can be the optimization and automation of the material flow of “Krasnyi Vostok Agro”, if, of course, the total production and logistics increase by a smaller amount or even decrease.

In the context of creating a forage base, even within the minimum budget for organization of compound feed production (from 2,4 million rubles) with low-power 78 equipment, this project will be recouped within 1,5 years. The total volume of initial investment will amount to 12 million rubles, provided that 5 feed bases are created at once with the production of the new feed.

The “Krasnyi Vostok Agro” company does not have a sales system for finished products. As a rule, raw milk is shipped by processing plants independently, which undoubtedly affects the cost of raw milk and, as a result, the primary purchase price of raw materials. The introduction of auto shops supplying Eco products to cities and villages of the Republic of Tatarstan will provide the population with high-quality products, and will also increase the company's profitability. In addition, transport services will allow for internal transportation, delivery of raw milk to warehouses or elevators, delivery of compound feed, etc. For effective warehouse management, it is necessary to exclude unnecessary operations and optimize processes that create added value. Today, the so-called digital supply chain method is often used for this - cross-docking, that is, accelerated forwarding of goods with minimal processing between receipt and dispatch. Today, this technology is especially popular in the production and marketing of essential goods. Analysis of this method shows that there are 2 most effective tools that guide the choice of this method of organizing the supply chain:

1. Reading electronic information using barcodes and radiofrequency devices increases the productivity of the warehouse, as the driver is automatically instructed to move to the desired gate. This provides real-time order tracking and reduces paper-based errors.
2. An even more suitable option is a radio frequency identification system using chips (RFID), it allows to receive information about incoming and outgoing goods without any scanning within the line of sight. Pallet information is automatically read when the cargo crosses RFID portals located on overpasses. Analysis of the literature has shown that such a pattern of material flow can also be carried out using the Track and Trace solution, which even allows customer to determine how high-quality the product is and whether it is original.

As a means of transport can choose a Gazelle 3302 car, which will be equipped with all the necessary equipment for collecting finished products and moving them to warehouses or to processors. This food truck includes a built-in refrigerator, 2 generator niches,

cabinets with shelves, electricity. The cost of 1 car will be 750000 rubles. As a result, increasing the efficiency of production and logistics activities will be possible in the context of optimizing the primary link in the creation of added value - the cost of vehicles within the enterprise. The total initial investment will amount to 42 million rubles, subject to the purchase of 20 vehicles and payment of wages to drivers + expenses on implementation of cross-docking technology in the company.

Thus, based on the above strategic alternatives, it's necessary to assess the implementation of projects aimed at increasing the efficiency of production and SC in "Krasnyi Vostok Agro" and reflect the results in the matrix of strategic alternatives in Table 24.

Table 24. Matrix of strategic alternatives

Product Processing Implementation Strategy (2)	Strategic Alternative 2	Strategic Alternative 4
	$K2 = a2 \cdot K = 50000000$	$K4 = a4 \cdot K = 35700000$
	$SB2 = b2 \cdot S = 1271824000$	$SB4 = b4 \cdot S = 794890000$
	$SO2 = S = 635912000$	$SO4 = S = 635912000$
	$SH2 = S/b2 = 317956000$	$SH4 = S/b4 = 508729600$
	$K = 50000000$	$K = 42000000$
	$E = 0,17$	$E = 0,17$
	$S = 635912000$	$S = 635912000$
	$PB2 = 0,1$	$PB4 = 0,1$
	$PO2 = 0,8$	$PO4 = 0,8$
	$PH2 = 0,1$	$PH4 = 0,1$
Forage strategy (3)	Strategic Alternative 1	Strategic Alternative 3
	$K1 = a1 \cdot K = 64818000$	$K3 = a3 \cdot K = 10800000$
	$SB1 = b1 \cdot S = 1399006400$	$SB3 = b3 \cdot S = 826685600$
	$SO1 = S = 635912000$	$SO3 = S = 635912000$
	$SH1 = S/b1 = 289050909$	$SH3 = S/b3 = 489163077$
	$K = 36010000$	$K = 12000000$
	$E = 0,17$	$E = 0,17$
	$S = 635912000$	$S = 635912000$
	$PB1 = 0,5$	$PB3 = 0,5$
	$PO1 = 0,4$	$PO3 = 0,4$
	$PH1 = 0,1$	$PH3 = 0,1$
	Increase automation (1)	Sales network creation (4)

Source: compiled on the basis of an analysis of the financial statements of JSC "Krasnyi Vostok Agro" and the initial investment in the project

where K – the amount of initial investment, rubles;

SB – the balance of current cash flows in conditions of increased demand for products, rubles;

SO – the balance of current cash flows in terms of the expected value of demand for products, rubles;

SH – the balance of current cash flows in conditions of reduced demand for products, rubles;

PB – the probability of increased demand for products;

PO – the probability of the expected value of demand for products;

PH – the probability of a reduced value of demand for products;

a_1, a_2, a_3, a_4 – correction factors for calculating the amount of initial investment in accordance with strategic alternatives;

b_1, b_2, b_3, b_4 – adjustment factors for calculating cash flow balances in accordance with strategic alternatives.

During the analysis of each strategic alternative, it is proposed to consider three scenarios of development of events, assuming the expected, increased and decreased value of the demand for products. This method was proposed by doctor of economic sciences Sadriyev Azat (Sadriyev et al., 2009).

The total balance of current cash flows in the conditions of the expected, increased and decreased demand for products for the entire period of implementation of the innovative project, taking into account the time factor in Table 25

$$\sum SO_t = \sum_{t=1}^T (SO_t \times \alpha_t) \quad (6.1),$$

$$\sum SB_t = \sum_{t=1}^T (SB_t \times \alpha_t) \quad (6.2),$$

$$\sum SH_t = \sum_{t=1}^T (SH_t \times \alpha_t) \quad (6.3),$$

where $\sum SO_i$ – the total balance of current cash flows in terms of the expected value of demand for products, rubles;

$\sum SBi$ – the total balance of current cash flows in conditions of increased demand for products, rubles;

$\sum SHi$ – the total balance of current cash flows in conditions of reduced demand for

products, rubles;

T – the term for the implementation of the innovative project, years (5 years in accordance with the calculation conditions);

α_t – discount factor, calculated according to the formula;

i – the number of the strategic alternative.

Table 25. Data of the total balance of current cash flows of “KV Agro”

№ Strategic Alternative	ΣSO_i	ΣSB_i	ΣSH_i
1	2033646576	4474022467	924384807
2	2033646576	4067293152	1016823288
3	2033646576	2643740548	1564343520
4	2033646576	2542058220	1626917260

The measurement error may be +/- 3,9 million rubles.

Net Present Value (NPVi) can be used to determine the expected result of the implemented innovative project in monetary terms in Table 26

$$NPVO_i = \Sigma SO_i - K_i \quad (6.4),$$

$$NPVB_i = \Sigma SB_i - K_i \quad (6.5),$$

$$NPVH_i = \Sigma SH_i - K_i \quad (6.6),$$

where $NPVO_i$ – the value of net discounted income in terms of the expected value of demand for products, rubles;

$NPVB_i$ – the value of net discounted income in conditions of increased demand for products, rubles;

$NPVH_i$ – the value of net discounted income in conditions of reduced demand for products, rubles.

Table 26. Data of the total balance of current cash flows of “KV Agro”

№ Strategic Alternative	$NPVO_i$	$NPVB_i$	$NPVH_i$
1	1968828576	4409204467	859566807
2	1983646576	4017293152	966823288
3	2022846576	2632940548	1553543520
4	1997946576	2506358220	1591217260

Calculate the weighted average value of net discounted income to take into account risk factors and uncertainty of the external environment (rubles) in Table 27

$$\overline{NPV}_i = NPVO_i \times PO_i + NPVB_i \times PB_i + NPVH_i \times PH_i \quad (6.7),$$

where PO_i – the probability of the expected value of demand for products;

PBi – the probability of increased demand for products;

PH_i – the probability of a reduced value of demand for products.

Table 27. Data of the weighted average value of the net discounted income of “KV Agro”

№ Strategic Alternative	\overline{NPV}_i
1	3078090345
2	2085328904
3	2280963256
4	2008114808

Thus, the most cost-effective solution would be to invest in strategic alternative №1 - increasing the automation of equipment at the company's mega-farms. Nevertheless, each strategic alternative is cost-effective, so the company can start with the automation of equipment, then work on creating a feed base and after that implement new sales channels with cross-docking and RFID, and consider expanding the range of products through processing of raw milk.

As a result, the digital logistic approach in the production activity of the enterprise is the engine of the development of material flows, as well as a consequence of the increase in the profitability of the production of raw milk and other agricultural products.

Discussion

This final section will outline some of the most important research findings from the literature review and show some areas for further research.

The DSC is truly in the era of automation. In order to build better forecasting systems and production processes, manufacturers are focusing on the quality and quantity of information, as well as more efficient transaction processing, delivery and flow monitoring, and worker handling.

The problem is this: the full digitalization of SC is becoming increasingly possible and realistic for firms to remain sustainable and competitive. The era of siloed SC is over, and corporations have to work to succeed globally in a more efficient, organized way.

The research has provided a broader perspective on DSC and the current challenges in this area. After reviewing the literature, it must be concluded that the exponential growth of emerging technologies suggests that organizations' production plans are shifting to digital ways. Every aspect of commerce, especially in SC, will continue to permeate all areas. Consumer and business demand also ensures that companies will be under constant pressure to make plans to organize, collaborate, integrate, digitalized and properly use technology to effectively adapt to consumer demand. In addition, because the level of DSC will determine the effectiveness of real-time product tracking, resource utilization, customer interactions and overall productivity, it is important that organizations be more informed about supply chain automation and how it can ultimately drive production and efficiency.

The fundamental methodology of digital SC will be recognizable to SC executives: analyze the current state of DSC, create a strategy for innovation, and develop a plan for transitioning to SCM in a digitalized environment. The essence of implementing digital logistics into the standard SC model is to create these elements, break them down, and develop their foundation. With the characteristics used to define and analyze the articles, the key issues and challenges that need to be addressed are mentioned. The results of this study will be of interest to logistics departments and firms choosing a fully integrated DSC and technology-activated companies.

Computer hackers are constantly looking for the fastest path to corporate structures and records. The fastest path is also not through the main entrance, but through the "weak links" that make up the technologically intertwined supply chain.

Organizations that consider and control the breadth of their interwoven supply chains, their vulnerabilities and limitations are best equipped to contain and overcome challenges. Key challenges include:

- trust is routinely transferred to suppliers and distributors without due diligence, risk management or control reviews;
- customer demands on businesses to demonstrate compliance with safety criteria are growing;
- equipment and machinery that rely on outdated, traditional technologies are difficult to protect;
- changes in trade policies.

COVID-19 shows that many businesses may not be fully aware of their exposure to international changes as part of supply chain integration. Modern technology and digital supply chain transformation are being successfully developed that can greatly improve end-to-end supply chain accessibility and promote even greater supply chain flexibility and longevity without any of the traditional "overhead" associated with risk management practices. The benefits of SCM automation are improved financial results and information processing efficiency, fault tolerance (information is replicated in every node, if the system fails, no information is lost), easier business-to-business interaction, innovative solution in terms of product tracking, visibility: elements can be observed throughout the chain, smart contracts, transparency, no need for middlemen, automation, worldwide availability through the use of blockchain, IoT, IoB, AI, robot.

Based on the analysis of the company's activities, contradictions were simulated using the theory of inventive problem solving. If the company knows and tries to solve the current contradictions in its activities, in the long term it is ready for the emergence and solution of any problems. These include:

1) if the cost of elements (which are included in the cost of livestock products) increases, then the initial cost of raw milk (its production) will increase, but it will not affect the increase in the price of the purchase price. This problem is especially acute for companies producing raw milk, in particular for "Krasnyi Vostok Agro". In recent years, there has been a significant increase in the cost of elements in the Russian market, as a result there has been a rise in the cost of milk and meat, while purchasing prices for raw milk have not risen much, and the level of state support has been significantly reduced and made more difficult.

Since dairy cattle breeding is a very capital-intensive business, agricultural companies also have to attract loans for the construction of facilities, their current repairs, the purchase of equipment and livestock. And loans are very expensive compared to Europe - 15% (for example, in Germany company can get an interest-free loan). In this case, previously the state subsidized 2/3 of the rate, now only part (%) is derived by calculation, on average less than half the rate). These costs are included in the cost of production (increase it).

In addition to loans the main components of the cost of livestock production (cost of milk, meat) are fodder, transportation costs, fuel and lubricants, electricity. Therefore, the increase in the cost of basic costs for the production of fodder - fuel, fertilizers, the cost of machinery and spare parts, seeds, led to an increase in the cost of fodder, which share in the cost of milk and meat increased from 50% to 60 - 65%.

The same situation with transport costs, the share of which increases every year, as the cost of equipment, maintenance costs and fuel and lubricants grows. All complex equipment of farms operates on electricity, the cost of which increases annually by 5 - 7 %, and depending on the territorial location of facilities, it can differ in 2 or more times.

The company can expand the product line (to double the profitability of its products and maximize profits) and build a processing plant, but it does not have enough funds to expand (build a processing plant) and implement a digitalization (automation of logistics and other departments), as there are no additional financial sources. And maintaining the level of procurement costs only complicates the situation and the financial situation of the company;

2) If a company produces raw milk, then the specific weight, for example, in the package of milk from the consumer is only 20 - 25%, but retail will allow the company to achieve figures 2 times higher. Milk production does not imply its profitability.

The company's products from the farm to the buyer passes through three stages: production, processing, retail. Production, whose specific weight for example in a package of milk at the consumer is only 20 - 25%, while in the processing from 1 liter of raw milk by reducing the fat content and various additives on the counter becomes 2 liters of dairy products.

Processing, the specific weight in the final product of 10 - 20% depending on the category of margin of the finished product,

Retail includes at least 50%. It includes logistics, storage, trade. However, the monopolized market allows company to mark up from 100% to the price of receipt from the sale of processing;

3) if a company is a part of one agricultural holding, then each division has different shareholders, but this only affects the reduction of the profit share for "Krasnyi Vostok Agro", because everyone is interested in getting his part of the profit.

There are also structural contradictions - the whole chain: farms, dairies, stores - divisions of one holding, but in each part the owners are different shareholders. One company is engaged in milk production, another - its processing, the third - sales of finished products. In this case private goals (i.e. of shareholders and companies) may not coincide with the goals of rational organization of the aggregate material flow. First of all, because everyone is interested in getting his part of the profit. That is why in the end the lowest specific weight of profit is formed in the chain at the most basic element – producer;

4) if a company digitalized its supply chain, then logistics management can become even more efficient and streamlined, but this will require an increase in the IT skills of SC employees and company at all.

Digitalization of the company's supply chain with the new Track and Trace and RFID solution will require employees to have a higher level of IT proficiency. Today, the company uses some IT in its operations, such as modern equipment in the milking parlors (DeLaval), but if it plans to build its own logistics system and distribution network based on the innovative solutions mentioned above, it will need to allocate additional money to improve the skills of its employees, in particular the level of PC and IT skills in general. One way or another, these costs will pay off a little later, as the use of these technologies will reduce the future costs of transporting their products, its storage and warehousing. This is very important primarily because raw milk must be stored under certain conditions.

As a result, it must be said that for the domestic market of agricultural products it is worth developing and implementing a strategy for the development of a digital logistics system for companies for a period of at least 10-14 years and focusing on it already with the current implementation of activities. The main elements of the development strategy will consist of:

- certain requirements and tasks in the field of integration of logistics and production;
- measures aimed at modernizing sales channels, which will affect the level of economic development of Russian companies.

Implementation of the digitalization plan and optimization of production and logistics activities in the company will increase the profitability of production, reduce labor costs for employees and rationally organize the movement of material flows.

Conclusion

In order to complete the research and to reflect the achievement of the objectives, it is necessary to answer the research questions. The first research question that this thesis focused on is as follows:

Q1. Is digitalization of the supply chain of an agribusiness enterprise necessary?

Definitely necessary, because the analysis of the financial situation and development strategy of the selected company showed that the proposed strategic alternatives of using DSC are extremely necessary for the company to optimize its logistics and production processes.

The second research question, formulated as follows, describes another achieved goal of this analysis:

Q2. If digitalization is necessary, how can it be accomplished?

As DSC strategic alternatives were identified and evaluated using the value chain and tools of the modern economy, the role of emerging technologies, innovations and strategies in understanding the alternatives found, the step-by-step digitalization plan of "Krasnyi Vostok Agro" was formed. Moreover, this plan is applicable not only in the field of agro-industry, but also in other industries. The analysis of best practices in digitalization of the supply chain has shown how and which methods are feasible in Russia and its economy, and the strategic alternatives are already being implemented in the company and are part of company's plan of digitalization (Appendix 3).

Most businesses are still grappling with how to construct a suitable simple data system for the first (second) level of DSC transformation. Individual activities within main distribution business functions are fragmentedly informatized and automated, which substantially "hinders" the development of streamlined modern logistics processes that pervade the DSC.

A certain number of businesses wishing to move to a digital model of logistical activity must make a logical decision about which stage should be the ultimate goal of change. Organizations can use the established model of sequencing key supply chain digitalization milestones to assess the current situation and create an action plan to achieve the degree of digitalization leading to the specific milestone selected as the long-term business model transformation goal. The main criterion for target stage selection is to achieve the best compromise between stage deployment costs and overall company benefits, which requires

professional training, research and iterative design considering different iterations of production scenarios in the digitalization phase.

Summing up the results of the company's development, that if the company dynamically improved its performance during the first 7 years of investment, then in the last 5 years the company's development has been greatly slowed down.

The dynamic course of the company's development taken was prevented by:

- 1) the financial crisis of 2008;
- 2) annual anomalous weather, since 2010, at the epicenter which turned out to be the Republic of Tatarstan;
- 3) the lack of state regulation of problems in the market for raw milk and dairy products leads to sharp fluctuations in prices for raw milk;
- 4) sharp fluctuations and unpredictability of grain prices: in 2009, grain prices fell by 2 times;
- 5) lack of government support.

The study of the current state of production and logistics activities of agricultural enterprises showed that the main development problems include:

- 1) lack of state support in the field of effective functioning of logistics at enterprises of the agro-industrial complex;
- 2) lack of qualified employees in the field of digital logistics of agricultural organizations;
- 3) lack of financial investments for the full implementation of modern logistics tools in Industry 4.0, since the cost of logistics IT quite high for domestic enterprises;
- 4) lack of financial investments for the construction of modern warehouse facilities with automated equipment;
- 5) lack of funds for the purchase of highly equipped vehicles, etc.

High productivity of the company "Krasnyi Vostok Agro" with the use of logistics concepts is possible in the following conditions:

- reducing the cost of goods;
- automation of business processes related to the supply chain;

- increasing the transparency of the B2B / B2C supply chain;
- improving the reliability and quality of supplies.

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Appendix 1.

Indicator	Indicator value											Change for the analyzed period		
	in thousand rubles										in% to the balance currency		thous and roubles. (column 10-column 2)	± % ((c. 10-c.2) : c.2)
	31.12. 2011	31.12. 2012	31.12. 2013	31.12. 2014	31.12. 2015	31.12. 2016	31.12. 2017	31.12. 2018	31.12. 2019	at the beginning of the analyzed period (31.12.2011)	at the end of the analyzed period (31.12.2019)			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Assets														
1. Non-current assets	1235055	1148174	11207400	10673974	10061639	9764170	9022026	8730421	9060673	70,4	80	-3289882	-26,6	
Property, plant and equipment	9464673	9085356	8673482	8091293	7527650	7232723	6491634	6128147	6457028	54	57	-3007645	-31,8	
Intangible assets other than goodwill	-	-	-	-	-	-	-	-	-	-	-	-	-	
2. Current assets	5189000	3452529	3865509	2768340	3133196	3022196	3082054	3396269	2260908	29,6	20	-2928092	-56,4	
Current inventories	1534395	974954	1274620	874167	1069206	1040387	1443428	1583088	873152	8,7	7,7	-661243	-43,1	
Trade and other current receivables	1993615	1533639	2070079	1561764	1800924	1876258	1607184	1732464	1218850	11,4	10,8	-774765	-38,9	
Cash and cash equivalents	1523495	832156	430281	118497	97918	62476	8542	30198	64661	8,7	0,6	-1458834	-95,8	
Equity and Liabilities														
1. Issued (share) capital	6538940	6531813	6525169	5876126	5867044	5711839	5687044	5719957	5738965	37,3	50,7	-799975	-12,2	
2. Non-	8116590	7591694	6022077	5320317	4556547	3792057	3340889	2967158	2416965	46,3	21,3	-5699	-70,2	

current liabilities												625	
including: borrowed funds	4697069	4297610	2899687	2324078	1764952	1269877	895439	696803	591146	26,8	5,2	-4105923	-87,4
3. Current liabilities	2884025	810196	2525663	2245871	2771244	3282470	3076147	3439575	3165651	16,4	28	+281626	+9,8
including: borrowed funds	1021255	54280	1552524	1673701	1740723	2207294	1407563	1613070	898216	5,8	7,9	-123039	-12
Balance currentcy	17539555	14933703	15072909	13442314	13194835	12786366	12104080	12126690	11321581	100	100	-6217974	-35,5

Appendix 2.

Пол респондента: **Respondent gender**

*

Мужской

Женский

Насколько важны принципы устойчивого развития при принятии решений в области управления цепочками поставок? Оцените от 1 до 10

*

**How important the principles of sustainable development are in making decisions in the field of digital supply chain management?
Rate from 1 to 10**

1

2

3

4

5

6

7

8

9

10

Как вы считаете, тема построения устойчивой цифровой цепочки поставок для "Красный Восток Агро" актуальна?

*

Do you think the topic of building a sustainable digital supply chain for “Krasnyi Vostok Agro” is relevant?

Да

Yes

Нет

No

⋮

Почему данная тема актуальна для компании? * **Why is this topic relevant for the company?**

Развернутый ответ

Какие факторы обусловили ее актуальность? * **What factors determined its relevance?**

Краткий ответ

Каковы дальнейшие действия в данном отделе компании и какие направления для развития вы выделяете как приоритетные? *

What are the further actions in this department of the company and what areas for development do you highlight as priorities?

Развернутый ответ

Какие инициативы в области цифровизации УЦП, характерные для России, уже реализованы в рамках компании? *

What initiatives in the field of digitalization of DSC, typical for Russia, have already been implemented in the company?

Развернутый ответ

Как вы считаете, компания готова к плану реализации полной оцифровки цепей поставок? *

Да

Do you think the company is ready for a plan to implement a complete digitalization of the supply chain?

Нет

Appendix 3.

Акционерное общество
 "КРАСНЫЙ ВОСТОК АГРО"
 420054, РОССИЯ, Республика
 Татарстан, г. КАЗАНЬ,
 ул. ТИХОРЕЦКАЯ, 5 офис 332
 Тел.: (843) 231-94-42, 231-94-33
 Факс.: (843) 231-94-42, 231-94-33
 e-mail: valieva_ie@krvostok.ru



Joint-stock company
 "KRASNY VOSTOK AGRO"
 RUSSIA, 420054, Republic of
 Tatarstan, KAZAN CITY
 TIKHORETSKAYA STREET, 5
 TEL.: (843) 231-94-42, 231-94-33
 FAX: (843) 231-94-42, 231-94-33
 e-mail: valieva_ie@krvostok.ru

№ _____ от _____ 20 ____ г.

ADOPTION DEED

of the dissertation work "Digital supply chain as a development strategy for the company"

by Iskhakova Aisylu in the activity

JSC "Krasnyi Vostok Agro"

I, the undersigned, Irina Valieva Irina Evgenievna, CEO, confirm the implementation of Iskhakova Aisylu's thesis results at "Krasnyi Vostok Agro".

The strategy developed in the dissertation work to improve the efficiency of production and logistics activities is used in JSC "Krasnyi Vostok Agro" to maintain the high quality of raw milk, as well as to increase the profitability of production and determine the long-term program of modernization and development of marketing channels.

The methodological support offered in the thesis was taken as a basis for improvement of material flows of production and the process of their management on the basis of analytical activity of the structural subdivisions of the company "Krasnyi Vostok Agro".

CEO



I.E.Valieva