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QUALITY REINDUSTRIALIZATION OF THE MACROREGION'S ECONOMY BASED ON DIGITALIZATION AND THE USE OF INFORMATION TECHNOLOGIES

Abstract: *The high heterogeneity and diversity of regions are obstacles to the sustainable development of the entire economy of the country. The aim of the study is to develop a methodological toolkit for reindustrialization in problematic regions and the organization of the digitalization process in various branches of the material sphere, based on the use of digital and information technologies. The research was based on the system approach methodology, the methodological apparatus of the information society theory, the methods of economic and statistical analysis, scientific abstraction, analogies and scientific generalizations. On the example of specific enterprises, the article reveals the use of digital and information technologies, which form the basis of reindustrialization in various sectors of the regional economy. The implementation of the proposed methods and mechanisms can become the basis for the development strategy of different regions and could help the lagging regions to move to a higher technological mode.*

Keywords: *Digital technologies, Lagging region; North Caucasus Federal District; Reindustrialization; Technological development.*

1. Introduction

In many countries of the world, including Russia, special attention is paid to the development and use of digital technology. The crisis phenomena, in which the economy and society are living, have shown that their development will depend on these technologies. According to experts, futurists and forecasters, industrial production in the future will be based on the use of appropriate analytics and digital technology tools. Such industries will be characterized by the fusion of different technologies, leveling the boundaries between production, digital and biological spheres. It is anticipated that many areas of life and service industries will be

automated and digitalized. It should be noted that digital transformation is progressing at a high pace, despite the difficulties and sometimes high costs. Even a small delay in this process can have extremely adverse consequences for the economy and society, and for the whole security of the country and its citizens. A realistic approach to assessing the state of affairs and occurring problems, realizing the need to address issues related to the use of digital technologies, and subsequently with the creation of a digital economy, should become a priority in the activities of scientists, government agencies and citizens. The implementation of the goals can be associated with the introduction of innovations and achievements of research, as

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well as digital technologies into the production system, with the effective use of the knowledge-based economy.

In Russia, issues related to the adjustment of scientific and technological work and the commercialization of its results are at a lower level than in advanced countries. Raw materials specialization, which has become the main development model, allowed the country to temporarily leave the zone of complete degradation and disappearance, but slowed down the process of transition to a more progressive technological mode based on innovative products and goods, digital technologies, and the results of the knowledge-based economy.

Before the outbreak of the pandemic, developed countries were actively involved in reshoring, the process of returning the industries that had previously been transferred to other countries. It seemed ordinary. But in fact, they must not only build new plants and factories in their country, but these plants and factories must be equipped with the latest advances in science and practice, software and digital technologies. In essence, there is a reindustrialization of industrial sectors.

The process of reindustrialization in these countries will continue at a faster pace, because it contributes to the creation of new jobs, which is very important right now, when the world economy is entering a recession and even a crisis. Industrial sectors are being re-equipped and the foundations of a new digital economy are being laid. Russia cannot be outside this trend. The level of technological development is a key factor that should ensure economic and social progress for the country.

The use of digital technology, and in general technological development, is relevant for Russia, which is characterized by the presence of many regions that differ in development parameters. Spatial dispersion, heterogeneity of regional development cause problems in the management and organization of interregional interaction and

production systems.

World Bank experts and Russian specialists (World bank, 2018) note that “to understand the specifics of managing the development of such a large and diverse country as Russia, it is extremely important to take into account the spatial structure of economic development. Regions in central Russia, Siberia and the Far East, the southern subtropical and mountainous regions, the Arctic zone differ markedly in many characteristics that affect the development of the economy, including natural and climatic conditions, soil fertility, natural resources, population density and demographic factors. In addition, the regions differ significantly from each other in terms of economic indicators. Thus, in terms of GDP per capita (purchasing power parity), the oil-extracting Tyumen Oblast was comparable to Norway before the recent ruble devaluation. At the same time, the Republic of Ingushetia was comparable to Iraq in this indicator. It is the interaction of these diverse economic landscapes that defines the face of the Russian economy. Without understanding the forces that shape the economy of individual regions, it is impossible to understand how to unleash the potential of economic development of the entire country” (World bank, 2018, p. 9).

Agreeing with the conclusions of the experts, it should be noted that they are missing one important point, which is that the regions differ not only in the listed parameters, but are characterized by diverse economies, technological fluctuations, and delimitation in terms of technical and technological development. Excessive differentiation of the technological space becomes a brake in interregional interactions and an obstacle to development. Without leveling or reducing the degree of uneven technological development of regions, it is problematic to expect an increase in the country's economy rate of development.

In world practice, there are various options for solving such problems. One of these options is the use of tools and mechanisms of

reindustrialization. The principles of reindustrialization have been and are now being applied by many countries and regions. They give the greatest effect when they are reproduced for lagging regions that have resources, fixed assets, labor potential, but they do not have methodological tools to carry out reindustrialization. Though the problems of reindustrialization are quite deeply studied by many researchers, there is still no generally accepted theory of reindustrialization.

Many economists pay close attention to the issues of reindustrialization, it is covered in the economic literature and studied by scientists from different angles. The contribution to the study of this topic was made by: S. Bodrunov (2015), who was among the first to deal with the issues of reindustrialization and now he offers the theory of reindustrialization and neonomics 2.0. R. Grinberg (2015) studied industrial sectors that can form the core of reindustrialization. S. Gubanov (2012) examined the features of neoindustrialization. E. Lenchuk (2018) investigated the problems of deindustrialization, the causes of its occurrence and proposed solutions. N. Komkov (2013a) substantiated technological aspects of reindustrialization. O. Sukharev (2014) recommended approaching reindustrialization as an economic policy. Other researchers are also dealing with these issues, but they interpret reindustrialization as an industrial revolution. We can list among them D. Rifkin (2011), who presents reindustrialization as the third industrial revolution, K. Schwab and N. Davis (2018) associate reindustrialization with digital technologies, K. Perez (2002), K. Freeman (1995) see it as necessary industrial policy. E. Reinert (2008) proves the preference for the development of industrial sectors. G. Hospers (2004) determines the possibilities of reindustrialization of the regional economy.

We would like to clarify our approach to understanding and interpreting the term “reindustrialization”. We consider reindustrialization as a process with which it

is possible to change the technological base of the material sphere branches. At the same time, special attention should be paid to industries, especially manufacturing. The reindustrialization process should be carried out on the basis of maximum use of digital and information technologies, with particular attention to the digitalization of production processes. The effective use of digital technologies and ICT will allow the subjects of the region to overcome the problems and depression.

2. Materials and methods

The research methodology is based on the information-oriented society theory, the theory of reindustrialization proposed by Russian researchers, a systems approach and the use of analytical methods adopted in economic research.

The object of the research is the North Caucasian Federal District (NCFD).

The subjects of the research are production and economic relations that develop in the process of reindustrialization, which is carried out using digital and information technologies.

3. Results

The North Caucasian Federal District was organized on January 19, 2010, it includes seven constituent entities of the Russian Federation. Its total area is 170.5 thousand square km, the population is 9.8 million people (or 6.7% of the total population of the country), including urban population of 5.0 million people and rural population of 4.8 million people. The district is characterized by agricultural specialization, but there are also industries, especially manufacturing, which make a certain contribution to the development of the economy.

Currently, the North Caucasian Federal District is at a low level of development and lags behind other districts in a number of indicators. The federal center, creating the district, meant to direct certain investment

flows here, which would be used to bring the district out of depression and ensure the average Russian level of development. At the same time, it was taken into account that the district does not have rich natural resources, and the main direction of development will be the search and use of new technological solutions based on new technologies. However, this process is realizing at a slow pace, which is associated with a lack of resources, and, what is most negative, with the absence of a clear strategic policy to transform the regional economy by forming its new structure.

The district is implementing the “Strategy for the socio-economic development of the North Caucasian Federal District until 2025”. The analysis of the Strategy’s provisions showed that many of its aspects have lost their relevance, not because they have been implemented, but because new ways and methods of their solution have appeared. It is necessary to make significant changes to the Strategy taking into account the new circumstances. In this case, we can agree with a number of researchers who believe that the problems exist not only in the district and regions, but also in the whole country. They can be solved by changing the “strategic vector of the Russian economy development, its orientation towards new industrialization” (Tatarkin et al., 2014; Solovieva, 2015).

Analysis of the NCFD subjects’ economy with the help of methodological aspects of technological mode theories shows that factors that form the third technological mode prevail here. The structure of the existing technological modes is formed by various industries that create the industrial basis of the economy. There is some growth in GRP, industrial production, the cost of fixed assets and investments in fixed assets in monetary terms. However, the growth rates of these indicators remain below the average Russian indicators. In the district, there is a low demand from business entities for innovative developments offered by regional universities and research institutes, at the same time, business entities do not receive proposals for

the development of new products or modification and reconstruction of production facilities. The current situation indicates the absence or low level of mutually beneficial issues for cooperation between science and industry. As a result, many developments of local researchers remain unclaimed, although they could bring certain benefits to both parties. It turns out that the subjects of the material sphere show a weak susceptibility to innovation, and they also have low motivation to conduct activities related to the introduction of advanced technologies into production. This situation leads to a small number of innovatively active organizations.

The operating environment of most of the district’s enterprises does not facilitate the establishment of long-term relationships based on common developments and their use. There are few collective innovation projects here that would be interregional. At the same time, we cannot say that there is no connection at all between enterprises. They exist, but their purpose is to establish partnerships for the supply of raw materials, goods and components, that is to say, the connections are of the production nature, and not the exchange of innovations or their joint development. This situation does not facilitate the creation of new products. According to K. Leonard (2016) “from the point of view of the long-term effect on the development of innovative activity, the density of the networks being formed may turn out to be a more important factor than the initial budgetary incentives”.

Summing up, it should be noted that in order to ensure economic growth in the district, it is necessary to intensify the work on the introduction and use of new technologies by subjects of production and economic activity, to improve the quality of products and their competitiveness. In particular, this approach can be implemented using advanced production technologies and software products.

In the North Caucasus Federal District, the number of the used advanced production technologies tends to increase. In 2018, they amounted to 3077 units, which is more than in the previous period by 166 units (Table 1). But the constituent entities of the district are beginning to lag behind the average Russian indicators in terms of the rate of their use, which leads to the fact that the enterprises of the district's economy stop developing and remain uncompetitive.

The main reason for the poor use of advanced technologies is the low cost of technological innovation. In the Russian Federation, the cost of technological innovation is growing, in 2018 compared to the previous year, they increased by 14.6%, but in the North Caucasus Federal District, costs for the same period decreased by 20.3%. However, the total number of the used technologies is increasing. In 2018, the number of organizations using similar technologies in the material sphere amounted to 7.6% from their total number, in the Russian Federation they account for more than a quarter.

The usage of the small number of advanced production technologies leads to the fact that in economic entities of the material sphere the level of labor productivity of personnel (workers and specialists) remains low, material and technical resources are used inefficiently. As a result, there is a conservation of technological backwardness and, in general, the district's economy remains uncompetitive. The most difficult situation is in industries, where there is a high level of morally and physically worn out equipment, there is a shortage of blue-collar workers and highly qualified specialists, a high measure of investment risk. It is especially unacceptable, but characteristic, that private capital does not invest in the development of processing and manufacturing industries, which are promising and can play an important role in the policy of the import substitution. Of course, it should be clear that the implementation of such policy also depends on machine and machine tool industries,

which must provide enterprises with high-class equipment, which will help to obtain competitive products. It is necessary to take into account, as N. Komkov (2014, p.11) notes, that "technological modernization in modern conditions is continuous, but its intensity is variable". Meanwhile, new production technologies and other progressive developments remain the only major tools and mechanisms for transferring the economy of the subjects to another level, to the level of innovative and technological development. The challenge is to increase the number of new technologies used in each subject. Otherwise, the district will not be able to leave the zone of depression and will remain at a low level of development.

At present, the processes of introducing new technologies are accompanied by constraining factors, which include insufficient financial resources, underdevelopment of cooperation and integration connections and lack of security for certain types of raw materials. Many problems are associated with the fact that the enterprises of the North Caucasus Federal District are at a low technological level and are not ready to adapt digital technologies to their production. This process is also hampered by a number of other factors, which include a lack of information on new technologies, small number of qualified personnel, low technological potential of the organization, lack of information about the sales market, lack of opportunities for cooperation with other enterprises and scientific organizations, insensitivity of the organization to innovations and weak financial support from the state.

The current situation requires a fundamental change, which can be implemented through reindustrialization using digital and information technologies. It is possible to start such work with the use of special programs that have found wide application in the practice of foreign companies and in some Russian enterprises. Table 1 shows data on the costs of acquiring and operating information and communication technologies

(ICT) and a comparative analysis of the use of special software products in the Russian Federation and the North Caucasus Federal District.

Table 1. Costs and use of special software in the subjects of the North Caucasus Federal District

Regions	ICT costs, mln. rubles Russian Federation–tn. rubles			Organizations, using Internet, %			Organizations, using special software– in total, %			including the management of automated production and / or individual technical means and technological processes, %			including CRM, ERP, SCM – systems, %		
	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
RF	1249.2	1487.6	1676.1	88.7	88.9	91.1	84.7	83.3	85.9	14.9	17.4	16.7	15.9	14.7	19.6
NCFD	9899.9	8832.7	10636.9	90.0	85.9	83.9	76.8	73.2	70.7	10.2	10.0	10.3	9.3	9.4	10.0
RD	908.5	905.9	1367.0	86.4	68.4	65.7	70.5	57.2	53.6	6.5	5.0	4.8	4.4	3.5	3.6
IN	220.3	379.7	521.5	100.0	100.0	100.0	100.0	98.9	98.9	7.0	8.7	8.9	10.2	13.5	13.7
KB	519.8	515.3	596.7	88.2	84.4	82.8	76.3	73.2	72.6	9.6	10.0	9.4	10.8	10.5	10.9
KC	590.3	515.3	598.6	84.0	90.3	89.1	81.1	87.1	85.5	9.8	11.4	10.5	9.4	11.8	11.8
SE	834.0	700.0	819.2	85.3	80.4	88.3	73.6	74.2	79.6	12.6	10.9	12.4	9.3	9.3	11.7
CE	1277.1	1423.0	1411.4	86.0	94.4	92.0	50.6	52.3	49.6	4.6	6.2	5.8	3.2	3.3	3.6
STA	5549.9	4323.6	5321.4	96.7	96.7	96.0	91.8	92.6	91.1	15.1	16.1	18.3	14.6	16.8	18.7

Source: Statistical collection. Russian regions. Socio-economic indicators, 2019

The analysis shows that the issues of mastering new technologies are at a low level in the studied macro-region. At the same time, it should be noted that the problems that accompany the constituent entities of the district can be solved with the use of information technologies and digitalization of production processes.

Currently, the main classes of information systems used in the practice of Russian and foreign enterprises are ERP (enterprise resource planning systems), CRM (customer relationship management systems), BI information, data and knowledge storage systems, SCM (supply chain management systems) and MRP (material streams planning systems).

According to the data in Table 1, in 2018 the number of organizations that use special programs to manage automated production and / or individual technical means and technological processes in the district amounted to 10.3%, which is 6.4% less than the national average.

The use of such technologies as CRM, ERP, SCM averaged 19.6% in Russia, and only 10% in the North Caucasus Federal District. We must admit that the indicators for Russia and the North Caucasus Federal District are low. At the same time, this suggests that there is potential and opportunities for growth.

Modern information technologies have an essential feature. If at the dawn of their appearance, information processing automation tools were mainly applied to already existing control procedures, then recently the situation has changed radically. They become a kind of catalyst for the dissemination of advanced management experience and modern management technologies. At the same time, business processes are optimized in accordance with the latest achievements of management theory and practice.

Most of the enterprises which activities were analyzed in the course of the study were characterized by the fact that they began to use information technologies and software products after they got into an unfavorable

situation related to product quality, with suppliers or with consumers, etc. That is to say, they had external factors, and not the initiative of its top management became the impetus for the introduction of new technologies.

As an example, you can imagine two businesses that are located in different regions: LLC “Saturn”, is engaged in the processing of dairy raw materials, the production of various assortments of dairy products. In the course of checking the quality of the products by the control authorities, it was found that the enterprise sometimes produces low-quality products that do not meet the standard. The company received a warning and was heavily fined. When analyzing this situation, it was found that the shortcomings are associated with devices that have been used for a long time and they were analog. The second point that was revealed by the analysis of the top management is that the company has difficult relationships with suppliers and contractors, as well as violations in logistics.

To eliminate the identified shortcomings and strengthen its position in the highly competitive dairy market, the company decided to approach the issue on a large scale and change its approach to the organizational and production structure in the workshops and divisions of the enterprise. The main points of the done work are the use of ERP for planning all resources, like labor, material, financial, etc. Here, they began to use the CRM management system, the introduction of an automatic RFID product quality tracking system. The company plans to get out of the difficult situation by using digital and information technologies.

The second company Sevkavrentgen-D LLC produces medical equipment. There is a full production cycle at the enterprise, from design to support service. The production is carried out on the basis of electronic control modules. Complex technological products are manufactured using digital technologies (3D printing) and software products developed by

its own IT service. In connection with the pandemic, the company’s products have become especially necessary for medical institutions.

Sevkavrengen-D LLC can be an example of a complete modernization and technical update, based on digital and innovative technologies with the installation of CNC - digital control, software products for the design and automation of production and financial processes, the creation of data storage and document management infrastructure. The enterprise has its own design office, and all developments are carried out independently, this concerns software and circuitry solutions. The company’s products are in demand in neighboring countries. Now they are planning to enter the far abroad market, within the framework of the national project “International cooperation and export”.

If we compare these enterprises, then the first had to deal with the introduction of new technologies due to impulses from the external environment. In the case of the second enterprise, the initiative was taken by managers and specialists, who set as the main goal the constant improvement of the quality of products in order to contribute to the health of the population, to meet the needs of the market to the maximum extent. The impetus for them is the internal factor. Thus, various factors can push to the need for reindustrialization through the use of information technologies.

In modern conditions, an important resource for the implementation of reindustrialization is the digitalization of production processes. The need to use digital technologies is also concerned by the spatial heterogeneity. Low agglomeration effect, the dispersal of the main production centers in different regions, the difficulties associated with state management make the use of these technologies inevitable.

Currently, many researchers study the “digitalization”, which is considered in the context of creating and defining the essence

of the digital economy. Many authors mistakenly point out that the author of the term “digital economy” is N. Negroponte (Negroponte, 1995). The concept of “digital economy” was introduced into the literature by D. Tapscott (1997), who was one of the first to give a more detailed definition of the digital economy. Russian researchers also pay a lot of attention to this issue, like L. Mylnikova (2019), who substantiated the relationship between innovation and the digitalization process. G. Litvintseva and S. Petrov (2019) investigated the impact of the digital transformation on the quality of life. V. Ivanov and G. Malinetskiy (2017) consider the main methodological approaches to the formation and implementation of the digital economy development program. Among foreign researchers, the studies by R. Bukht and R. Hicks (2017), N. Chakpitak et al. (2018), H. Goldstein (2017), K. Tan et al. (2017), S. Martin-Shields and N. Bodanatsa (2018), A. Moazed and N. Johnson (2016) can be noted.

We consider digitalization as a process, part of the digital economy, which transforms various production and service processes into digital format.

Digitalization is sometimes understood straightforwardly, namely, as a process of deployment and use of modern technologies. However, it should be interpreted as the ability to adapt the enterprise, firm or company to “various forms of digital technologies used by the customers, partners, employees, competitors, and also, at the same time, to predict how their expectations and behavior can change” (Digitalization, 2019, p.12). The introduction of new technologies itself is a small part of the digitalization process, the main one is what problems will it solve and what processes will it transform. In the «Practical recommendations for transferring business to digital technologies» (2019), it is said that “successful digitalization is not a one-time action, but a continuous process that requires flexible thinking and the creation of an

organizational structure that will allow the company to constantly respond to emerging digital trends” (Digitalization, 2019, p.17).

Initially, digitalization or the use of digital technologies has always been perceived as the need for fundamental changes in the work and managing methods of organizations, as a response to the general attraction to digital sphere in a highly competitive environment. The digitalization process will be evolutionary, but its speed will grow every year, in every country and in every company. Gradually, but firmly and steadily, the cost of using digital technologies will decrease, so the followers of the companies-pathfinders will find new ways to reduce the cost of these technologies. Moore's Law also works in this case.

The process of implementing digitalization is associated with the need to develop a specific strategy. When talking about a strategy on a specific occasion, then, as a rule, two strategic vectors are identified: “the strategy of attracting customers and the strategy of digital solutions”.

The first direction implies an individualized approach that must ensure customer support and loyalty.

The second direction is based on the necessity to focus on products and services with added information that provides new value for customers, that is to say, the product is the same in form, but its content can satisfy more needs. The choice of this or that direction depends on many factors, including the mission and specialization of the company, market position, creativity of top managers, the availability of the necessary specialists (Digitalization, 2019, p.22-23).

Digitization is not a panacea that solves all problems. Sometimes it happens that breakthrough technologies do not give the result that innovative companies count on. The best practices, both world-famous and local ones show that good results are achieved by those firms and companies that first use traditional operating and software technologies (ERP, CRM, etc.) and

then move to more complex ones. With the help of such technologies companies create other value, solve more complex problems that reduce transaction costs, increase productivity and competitiveness, maximize profits.

As an example of digitalization, we can consider the use of robotic devices in agriculture. In one of the entities of the district, the robotization of milking process was introduced. The enterprise purchased animals of a certain breed (Holstein-Frise) as well as the milking machines of the German company “Westphal-Mobile”, which contain robotic devices.

The total cost of the equipment was 60 million rubles, including 21 million rubles of government subsidies. In less than two years, the farm achieved high results. Animals and equipment were serviced by two people, all cow care processes were automated. The farm’s production indicators were high, so the average annual milk yield was 9500 kg, the calf yield was 98%, the profitability from the sale of milk was 22%.

In the near future, the company plans to construct a new building for the installation of the second robotic line. The farm can afford it because it has a cultivated area of 1000 hectares, in addition, there are premises that will allow it to install new equipment and housing for the livestock.

The most serious problem for those who have purchased robotic farms is the lack of local specialists who would understand the computer installations for the equipment. In cases of failure in any part of equipment, farm has to consult with foreign specialists or colleagues from other regions, and sometimes invite them to troubleshoot. All this introduces additional costs.

3.1. Digitalization in the system of the product quality improvement

The goal of digitalization is to not only increase labor productivity and capacity,

replace and modernize fixed assets, but also to improve product quality.

The problem of quality, in any socio-economic system, is the most important factor contributing to an increase in the standard of the population living and ensuring socio-economic and natural-ecological safety. As an economic category, quality contains a certain set of product features, which reflect and determine the criterion of suitability, the ability to meet the consumer requirements and correspond to the specified purpose.

Quality is a complex concept, which helps to assess all aspects of the enterprise’s activities, including economic efficiency. In the economic literature, as well as in various studies, the concept of quality is interpreted in different ways.

The International Organization for Standardization, which establishes quality (ISO-8402) as the ability of a product, which has a set of properties and characteristics, to satisfy specified, necessary or planned needs. This standard operates with such concepts as “quality assurance”, “quality management” and “quality spiral”. The requirements for quality at the international level can be identified by standards based on the ISO 9000 series.

The peculiarity of the ISO 9000 series standards is that they establish uniform rules that assess the quality system and at the same time establish the relationship between producers of products and consumers. All activities of the International Organization for Standardization are aimed at meeting the needs of consumers. Based on this, the standards are periodically revised and now a new version of the 9001 standard is in force, which changed significantly compared to the previous version. The ISO 9001: 2015 standard was developed in accordance with the Annex SL to the ISO (ISO/IEC Directives, Part 1 Consolidated ISO Supplement - Procedures specific to ISO), which defines the requirements for regulatory documents for management systems. It establishes a new, uniform standard for the

structure of management systems (not only for ISO 9001, but also for other management systems).

Therefore, we dwell in detail on the quality of products, because quality is one of the main factors through which the subject of the economy achieves competitive advantages. The general criteria for quality are usefulness, uniqueness, security and value.

Each of these criteria can become the basis for the formation of certain advantages, in particular, the usefulness of products can be a guideline for developing a strategy that increases the profitability of business or meets the needs of consumers to the greatest extent.

The competitive advantage of the product's uniqueness is that it cannot be found in competitors and there is no other product on the market that could replace it.

Product security and its brand give a competitive advantage. However, the brand must be legally protected, it must be difficult to copy it. These actions are necessary in order to ensure a high reputation, long-term stability in the market and a long product life cycle.

An important component of a product that provides a competitive advantage is value. The value has a target orientation and is focused on a specific group of consumers who are regular buyers of this product.

Of course, these criteria are generally known and are not limited to product quality indicators. The use of digital technologies is an important peculiarity, especially the Internet of Things (IoT) (Popkova, 2019), which functions are deepened and strengthened, so that the products acquire a new quality that better meets the needs of consumers. In fact, the subject of the economy acquires a sustainable competitive advantage, which allows it to expand the area of its market.

3.2. Manufacturing process and digital participation in the product quality assurance

The products produced by the studied farm, which was mentioned above, supplies its goods to the processing enterprise Nalchik Dairy Plant, which is located in the city district. Two years ago, control bodies in the field of consumer rights protection revealed low-quality products produced by the company, which resulted in large fines. This situation became the reason for the replacement of top management and the update of the development strategy. The improvement of the products' quality became the main direction of the company development. This strategy is recognized in many countries (Bravi *et al.*, 2018).

The enterprise has carried out modernization and reconstruction using digital technologies and if in the past the plant used a SCADA system, now it is launching new lines based on information and digital technologies. The plant began to implement RFID, ERP, as well as a PLM system that will provide product lifecycle management. An important feature of this system is its ability to provide interaction between different manufacturers and different enterprises. During the reindustrialization, the company improved the quality of its products, saved and consolidated its position on the market. Therefore, the company avoided the bankruptcy and loss of the market.

Another studied enterprise also belongs to processing, but it has different products. LLC "KVEST-A", is engaged in the processing of wool and the production of woolen goods. Recently, the company has found itself in a difficult situation related to relationships with suppliers and contractors, violations in logistics. However, the enterprise developed a set of measures that improved the situation. They began to use the CRM management system, the next step is the introduction of an automatic RFID product quality tracking system. Now the company plans to get out of

the difficult situation by using digital and information technologies.

The given examples show that there are opportunities for reindustrialization of various branches of the material sphere in the district, using software products and digital technologies. The challenge consists in speeding up and scaling up these activities.

As noted above, the third technological mode dominates in the district, and now the progressive development of the district may be associated with the formation of the fourth mode, and further. When choosing technologies, which will help to carry out this transition, it is necessary to take into account what competitive features of the region, industries or enterprises it is possible to realize in this case.

An important goal of the subjects of the North Caucasus Federal District is the elimination and of the existing imbalance between the resource-raw material development model, which the district adheres to at present and the need to create a new type of economy. The main tools for achieving this goal are the use of digital and information technologies, the introduction of technological innovations into production. As N. Komkov (2013b, p. 5) notes, “in the program documents on the rise of the country’s economy, technological modernization is declared as a strategic direction of development, the main factor for its provision can only be innovation”. The implementation of the set goals depends on the level and pace of scientific and technological development, which are determined by the capabilities of the district, which are aimed at ensuring the functioning of science and technology as a single system closely related to production. The main results of such activities are the creation of new scientific knowledge and their subsequent implementation in new technologies, or in new products, produced with these technologies. In our opinion, this difficult problem can be solved using digital technologies.

The region, as a system that produces the necessary benefits, needs a constant increase in the level of its activities. Here, a greater amount of various information is accumulated, which store great potential opportunities for extracting useful analytical information, basing on which, it is possible to identify dominant or inhibiting development trends, determine a development strategy, and find new solutions. The volumes of information that are concentrated in the region are semi-structured, and under certain conditions they can be represented in the form of knowledge. In this case, one of the directions of research is to turn this knowledge into competitive advantages.

For the North Caucasus Federal District, which has a certain potential, but there is no transformation of this potential into an effective factor of economic growth, the issues of using digital technologies and knowledge management on a regional scale are becoming relevant to ensure its competitiveness, increase labor productivity and guarantee progressive development

4. Conclusion

In an environment of permanently recurring crisis phenomena, the persistent unevenness and delimitation of the Russian regions in terms of socio-economic parameters of development, the low level of technical condition and technological processes necessitate the development and implementation of such a policy that would be focused on tight interconnection, interaction and interdependence between the information, digital and production aspects of economic development. Reindustrialization could be such policy. This approach will make it possible to build an effective strategy for technological evolution and build an effective system for realizing the technological and production potential of different types of regions, which will develop on the basis of digital and science-intensive technologies.

The conducted research revealed the existing discrepancy between the possibilities of using new technologies and the resource-raw material model followed by the studied district. This provision complicates the progressive development of the district. The issues related to the transformation of the used development model and the implantation of a new structure of the economy can be resolved through the use of the principles of reindustrialization.

The use of digital and information technologies in agro-industrial production shows that they can be associated with prospects that, over time, will allow the region to completely switch to self-sufficiency in agricultural products. The current situation in the agro-industrial production of the region and the country convinces us that the use of information and digital technologies and a well-balanced policy of relations between the state and rural producers will help to solve the issues of food security and food self-sufficiency of the country.

The problems of the studied district, as well as similar districts, can be solved with the help of reindustrialization through digitalization, the use of digital and software technologies. This is not a short-term process, but a large-scale action which needs to prepare the resources necessary for implementation, like labor, financial, material, organizational ones (management personnel).

New technological, software and digital technologies remain the most important tools and mechanisms for transferring the economy of the constituent entities of the district to another level, to the level of high-tech development. One of the tasks is to increase the number of new technologies used in each economic entity. Otherwise, the district will not be able to leave the zone of depression and will remain at a low level of development. The process of using new technologies cannot be stopped, so it is necessary to be proactive.

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