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EFFICIENCY OF DIGITALIZATION OF INTERCORPORATION INTERACTIONS

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Abstract

Increasing the level of development of information and communication technologies and the transition of the economic system to a new stage of development leads to the emergence of completely new knowledge in the study of existing economic trends, the subject of which are inter-firm interactions. Well-known researchers of this direction (Williamson, Miles, Castels, Sheresheva, etc.) came to the conclusion that the various types of integration that certain enterprises resort to are the most effective, as they expand the capabilities and boundaries of the use of information and communication technologies. This article addresses issues affecting the assessment of the efficiency of digitalization of intercompany interactions. This area of research is becoming more and more relevant today, as the entire world community is in a difficult situation of the spread of a new coronovirus infection. As a result of the study of the efficiency of digitalization of the network form of business organization, the process of digitalization at an industrial enterprise was defined, the stages of its digitalization were identified, and an algorithm for managing this process was also proposed. In the course of scientific research, a methodology was developed to assess the efficiency of digitalization of intercompany interactions through the use of econometric analysis.

Keywords: Assessment, digital technologies, efficiency, integration

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1. Introduction

Currently, the Russian Federation is actively developing and implementing new digital technologies. There are various legal documents that regulate the algorithm for the transition of the economic system to the innovative digital path of development.

The main sector of the Russian economy is industry, which is experiencing significant difficulties in the field of regulatory and legal innovation initiatives, the introduction of the results of research and development (R&D) in the practical implementation and renewal of fixed assets. An exception to the rule is the enterprises of the military-industrial complex, aviation, space, and nuclear industries.

Let us reflect on the dynamics of industrial production for the period from 2014 to the first half of 2019 (Table 1):

Table 1. Increase in industrial production

Industrial production sector	**2014**	**2015**	**2016**	**2017**	**2018**	**January - June 2019**	**Shipped in total Jan - Jun 2019**
	%					trillion rub.	
Industrial production (generally)	2,5	-0,8	2,2	2,1	2,9	2,6	33,2
Mining	1,7	0,7	2,3	2,1	4,1	4,0	9,3
Manufacturing industries	3,2	-1,3	2,6	2,5	2,6	1,9	20,4
Provision of electricity, gas and steam; air conditioning	1,0	-1,0	2,0	-0,4	1,6	0,0	2,9
Water supply; wastewater disposal, waste collection and disposal, pollution elimination activities	-2,0	-4,8	0,8	-2,1	2,0	1,5	0,5

Analyzing the structure of industrial production in Russia, it is possible to conclude that the largest increase in the structure of industrial production is occupied by mining.

This article will focus on the potash industry, which is represented in our country by “Uralkaliy” PJSC. The dynamics of production volume at this enterprise is negative. This situation is associated not only with several emergency areas but also with the insufficient implementation of digital solutions in the production process (Lee et al., 2018; Papadopoulos & Reilly, 2019).

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2. Problem Statement

To ensure the development of digitalization in industrial enterprises, it is necessary to focus on public-private partnership in the field of introducing the latest information and communication technologies into the production process. It should also be noted that to expand the opportunities and boundaries of the use of ICT, it is necessary to develop the professions of the future.

Unfortunately, at this point in time, the current level of the digitalization index in Russia shows a negative trend compared to the same indicator calculated in the EU countries in 2018 (figure 1).

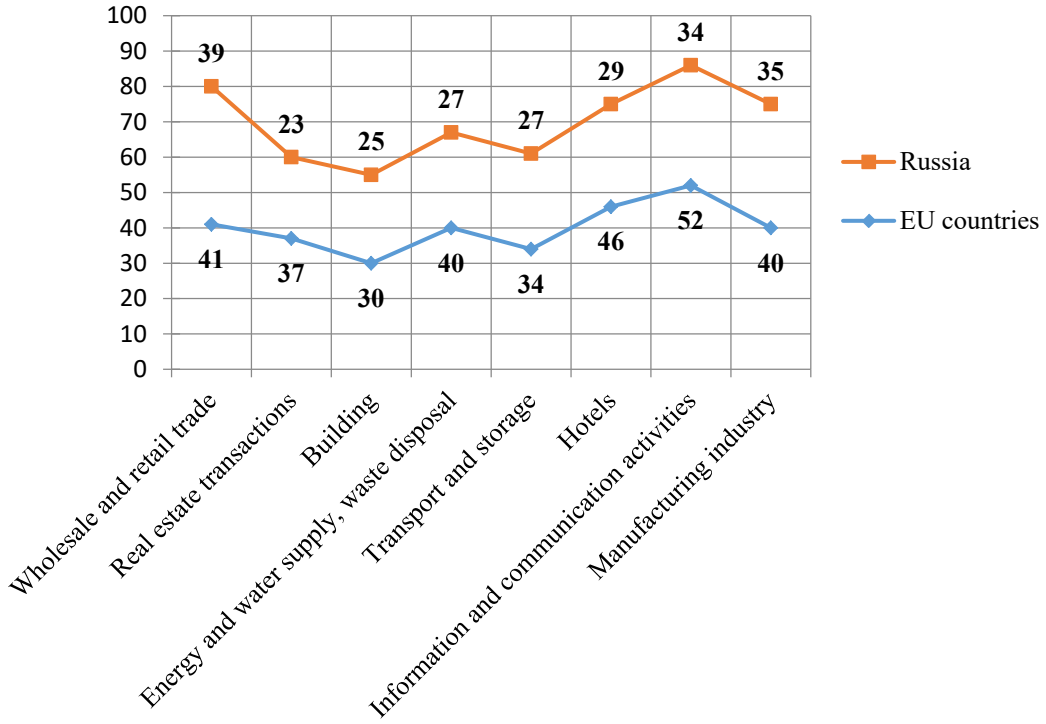

Figure 1. Index of digitalization in Russia and the EU countries in 2018

Touching upon the issues of assessing the digitalization of intercorporation interactions, an insufficient level of study of this problem by the scientific community can be noted. This is due to the fact that today the widest spreading in the industrial production sector belongs to network forms of business organization, which, like other forms, are subject to change (Berman & Dalzell-Payne, 2018; Song, 2019).

3. Research Questions

All known forms of intercorporation interactions are aimed at increasing the competitiveness of the product by reducing its cost, which, in turn, is associated with the use of the latest technologies (Ondrus et al., 2015; Perren & Kozinets, 2018).

This issue is of scientific interest in the field of the role of intercoproration interactions digitalization efficiency in the Russian industry. Speaking about the development of digital infrastructure,

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we must pay attention to the stages of digitalization of society. For example, the Eurasian Economic Commission (EEC) has documented the following stages of digital transformation (Condorelli & Padilla, 2020; Qin et al., 2020). The initial stage is characterized by the creation of a program for implementation of research projects, the formation of "digital" budgets, as well as the creation of a prototype of the Eurasian Digital Platform (EDP). Transition to the functional stage indicates the creation of an algorithm for the implementation of a large number of projects based on the EDP (Mäntymäki et al., 2019). At the final stage, a functional ecosystem of digital platforms is being created in all market segments (Healy, 2016).

Answering the question of what digitalization of intercorporation interactions is, we come to the conclusion that this is a progressive introduction of the latest digital and communication technologies at each stage of production or provision of services in order to increase the level of labor productivity, upgrade the production process and reduce transaction costs (Capobianco & Nyeso, 2017).

One of the main issues related to the digitalization of intercorporation interactions remains the creation of a certain algorithm for managing this process (Figure 2).

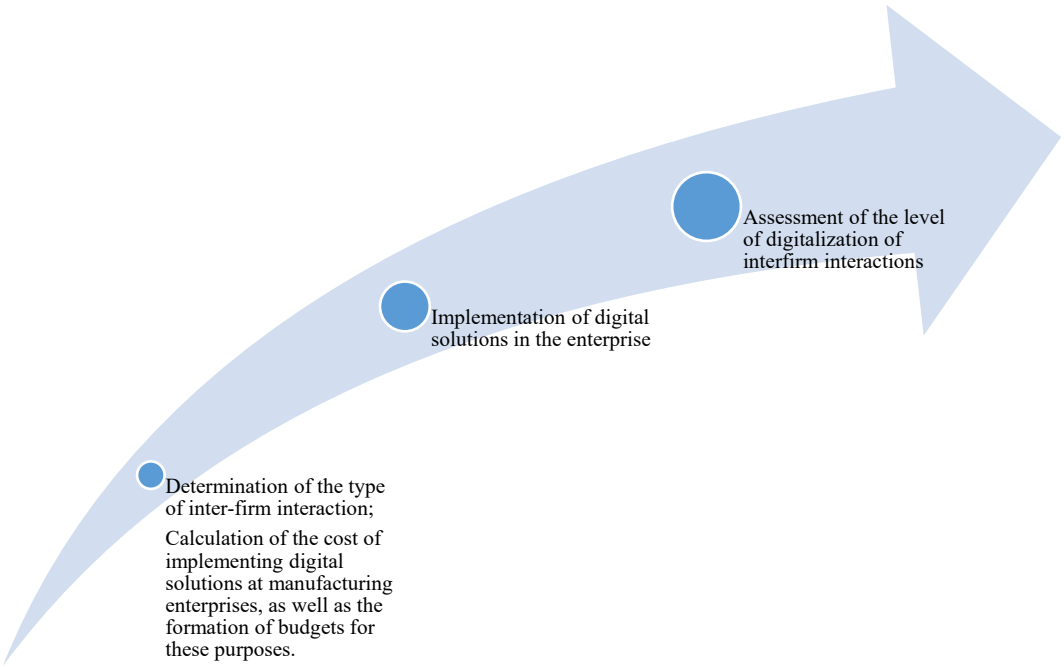

Figure 2. Algorithm for managing the digitalization process at the enterprise

4. Purpose of the Study

Formation of a methodology for analyzing the level of efficiency of digitalization of inter-company interactions in the conditions of changes in existing economic models.

5. Research Methods

Consolidated analysis of existing research, which involves the creation of an author's methodology for calculating the effectiveness of the level of digitalization of inter-company interactions and an algorithm for managing this process.

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6. Findings

Of particular interest to the team of authors is the assessment of the efficiency of digitalization of the potash industry. In the Russian Federation, this industry is represented by “Uralkaliy” PJSC (Amador & Cabral, 2016; Ruggieri et al., 2018).

By the end of 2020, the following technological and digital solutions were implemented at the studied enterprise:

- a mobile application for employees, which is designed to unite employees of different age, professional, and territorial groups of the company and subsidiaries into a single information space;
- a project of the service of the deputy technical director for repairs and management of production assets related to the implementation of a reliability management system for equipment at sylvinite processing plants;
- a positioning system for mine personnel, which is designed to improve the safety of mining operations;
- MES systems, which are responsible for day-to-day planning at the processing facilities;
- a corporate information system that allows management to timely and fully receive information necessary for making management decisions on all business processes: production, logistics, finance, procurement, repairs;
- a mining and geological information system, which made it possible to create a common information field for representatives of different services like miners, geologists, and surveyors.

These innovations were introduced with the aim of increasing labor productivity, ensuring positive dynamics of key economic indicators, as well as reducing accidents and improving safety at this enterprise.

To develop a methodology for assessing the level of digitalization of intercorporation interaction, an econometric analysis was carried out.

Multiple regression equation, in which the resulting feature is the volume of intangible assets, having a direct impact on the level of digitalization at “Uralkaliy” PJSC enterprise, enables to single out three main factors that are associated with the introduction of information and communication technologies in production processes.

$$Y = 1433 + 0{,}177X1 + 0{,}114X2 + 2481{,}6X3 \quad (1)$$

where Y – resulting feature is the volume of intangible assets;

X1 – volume of revenue;

X2 – labor productivity level;

X3 – volume of investments.

The resulting regression equation demonstrates the relationship between intangible assets, revenue, labor productivity, and investment. It can be seen from the equation that with the growth of investments, the intangible assets of the enterprise also grow. At the same time, the main factor in the growth of

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intangible assets is the level of investments, which expand possibilities and boundaries of application of new digital communication technologies in modern society.

The obtained model is characterized by a high factor dependence of the resulting feature (more than 88%) for the potash industry.

From the author's point of view, intangible assets have a structural relationship not only with the level of digitalization of production but also with the process of introducing information and communication technologies and their impact on the efficiency of intercorporation interactions (McKee, 2017).

7. Conclusion

The result of the study is the author's methodology for assessing the level of digitalization of intercorporation interactions, which links the security of an industrial enterprise by intangible assets with the level of its digitalization. To determine the current level of digitalization at “Uralkaliy” PJSC, the base value was taken as the volume of intangible assets in 2015, which comprised 35 billion rubles. The choice of the basic year is premised on the fact that in 2014 the surveyed company launched a major investment program aimed at creating a digital system for making technical and managerial decisions based on the use of information and communication technologies.

Based on previous studies, the following levels of digitalization are proposed:

Type I - the level of digitalization of intercorporation interaction is assessed at up to 50% (inclusive);

Type II - the level of digitalization of intercorporation interaction is assessed from 51% to 75% (inclusive);

Type III - the level of digitalization of intercorporation interaction is assessed at 76%.

We will assess the level of digitalization for the potash industry using the example of “Uralkaliy” PJSC (Table 2) (Popov et al., 2020).

Table 2. Digilization level author typology for potash industry

Year	Intangible assets	Digitalization level, %	Digitalization type
2015	35,17	17,58	I type
2016	35,10	17,55	I type
2017	34,87	17,44	I type
2018	151,62	75,81	III type
2019	149,12	74,56	II type

Analyzing the data obtained, we can say that the change in the level of digitalization indicates the process of depreciation of intangible assets of an industrial enterprise and the continuous development of digital technologies in the industrial production sector.

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