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INFLUENCE OF INFORMATION TECHNOLOGIES ON THE INNOVATIVE DEVELOPMENT OF THE ECONOMIC SYSTEM

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Abstract

In the context of the transition of the modern word to a new economic reality, we are witnessing an increase in the requirements for the formation an economic system that most fully meets diverse technological, social, humanitarian and other challenges. Of particular importance here are information technologies and their increasing influence on all spheres of activity of people, as well as firms and the state. In fact, information technologies are transforming the behavior of all participants in socio-economic processes, which leads to noticeable positive changes. It allows business entities to completely satisfy their growing needs in the conditions of limited economic resources and virtually unlimited information resources. But along with the positive changes, there are also negative ones that are expressed in the risks that information technologies bear both to individual economic entities and to the state as a whole. We should take into account all these circumstances when forming the state innovation policy as an instrument of solving an important complex problem. It is related to constructing a model of the economic system ensuring a high level of competitiveness of the national economy, sustainable dynamics of its development and reliable protection against various external and internal risks. This article presents the results of a study of this problem and proposals for its solution.

Keywords: Economic system, innovative development, information technologies, state policy, competitiveness, risks.

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1. Introduction

Information technologies are increasingly becoming part of our modern life, which cannot but affect the functioning and development of the economic system as a whole. If we are talking about a person, the occurring changes are reflected in all aspects of his life, including, first of all, communication with colleagues in the framework of the company and its separate unit, public organization, state structure, etc. This implies not only the growth in the amount of information tools used and in the time to work with them (quantitative changes), but also the construction of a new type of thinking, which entails qualitative changes. Today, the specific "information thinking" is being formed. It modifies all the important processes associated with an individual's economic behavior, such as analysis, selection, establishment of business relationships, decision making, etc. It should be emphasized that a person with such "information thinking" should not be considered only as a consumer. A person, being the carrier of such factors of production as "labor" and "entrepreneurial abilities", acts as a hired employee of a company or state institution, the owner of the enterprise or its manager. In these conditions, his economic behavior is being transformed under the influence of increasingly developing "information thinking" and expanding skills in using information technologies. All this leads to changes in the activities of all business entities, ensuring the transition to a qualitatively new level of economic development. This transformation is followed by the transformation of tools and principles for establishing economic relations between various economic actors, including the state. In aggregate, these processes lead to significant changes in the economic system, as well as in the directions of searching for new models and target settings for its development. All these steps should be directed to solving the most important economic problem – to maximize the satisfaction of the economic interests of all entities with the efficient use of the resources at their disposal. The significance of this problem is due to strengthening requirements to increase the competitiveness of national economies and their economic security in the context of globalization. Its solution depends today on the action of many factors affecting the process of informatization of all spheres of life of the modern society.

2. Problem Statement

The presence of many factors determining the specificity of the process of informatization of the economy has an increasingly active effect both on the development of the economic system and the level of competitiveness of the national economy in the world market. The traditional and emerging new risks are closely related to such changes. Because of the need to minimize or eliminate risks, it should be understood that today we cannot be just spectators there. The new reality requires an active research position and scientific conceptualization of the processes of transformation.

2.1. The most important problem in the field of modeling an effective economic system

The most important problem of economic science in this context should be considered the development of model of the economic system that would be able to cope with the solution of its tasks with maximum efficiency. A key characteristic of such a model should be a high susceptibility to innovation and the ability to stimulate the innovative type of development of business entities. This raises additional questions related to the development of practical recommendations for the implementation of the model,

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taking into account the specific conditions, as well as the advantages and disadvantages of each individual country.

2.2. The problem of combining efforts in the field of technology and economics as a necessary condition for creating an effective model of the economic system

Obviously, the processes of informatization, as well as the development of innovative tools, thanks to which it gains straight, lie not only in the field of economics, but also in the field of technical sciences. The development of technical sciences is subject to a number of specific laws, which must be taken into account when modeling and improving the economic system. In this context, particular attention should be paid to creating the necessary conditions in the field of the development of science and technology, as well as education. An emphasis on this area will contribute to increasing the country's competitiveness and strengthening its position compared to countries where there is a technological lag. Thus, the statement of the problem associated with the formation of an innovatively susceptible economic system has another important aspect. It lies in the field of providing not only technological, but also economic superiority in the world arena. This determines the significance of the problem under consideration, both from theoretical and applied positions.

3. Research Questions

The extension of information technologies is the basis of our understanding how to ensure the innovative susceptibility and the innovative type of development of economic system in the modern conditions. In relation to this study, information technologies should be highlighted as a studied subject. The main research questions of this study are connected with the innovation-oriented enterprises that develop and actively implement information technologies. Based on this, the impact of information technologies on the functioning of a wide range of business entities and the economic system as a whole, including security issues, should be considered.

3.1. The impact of information technologies on the development of the economic system

Over the past decade, an avalanche-like (up to complete transition) spreading of information technologies against the backdrop of a general intensification of innovations has been observed throughout the world. This is especially noticeable in the services sector, the development of which is an integral feature of a post-industrial society. At the same time, we should not talk about a significant lag in enterprises producing goods in the material form. Information technologies are actively used by them, both in production processes and the processes of communication with real and potential consumers. And all this is possible thanks to the fact that information technologies allow us to integrate into a single whole many process, at first sight, completely independent, and also effectively manage all this (Ilchuk & Mushenyk 2018).

3.2. Transformation of management system in the conditions of informatization

Information technologies are fundamentally transforming the nature of management at all levels – the company, region, state. In this context, a modern manager must make business decisions, working with

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constantly increasing volumes of information, varying in level and scale. Moreover, the work of managers also differentiates today:

a) decisions are made by managers on the basis of recommendations formed by the using the information technologies, including artificial intelligence;
b) decisions are made by managers based on their own knowledge, skills and experience, taking into account the recommendations developed by information systems.

In fact, this is close to a new division of managers into "blue-collar" and "white-collar" workers. These issues become especially important in the case of large business structures and government bodies, taking into account the importance and scale of their managerial decisions. Such a differentiated approach forms a sort of new managerial elite, whose work determines the well-being of the employees, companies, regions and the country as a whole, including its security. This demonstrates a new understanding of the essence of the economic system and economic relations forming an effective management system in the conditions of development of information technologies.

4. Purpose of the Study

Today, no one calls into question the importance of studying the impact of information technologies on the innovative development of the economic system. Scientists from many countries belonging to various scientific schools are working today in this area (Bezuidenhout et al., 2017; Jackson & Senker, 2011; Vallejo & Wehn, 2016; Wad, 2019). As for Russia, in our country there are also a fairly large number of researchers studying this problem at the mega-, macro-, meso- and micro-levels and focusing on both fundamental and purely applied issues. In addition, we can distinguish research work tied to various branches, such as industry, construction, agricultural sector, as well as banking, insurance and other areas (Kolesnikov et al., 2018; Kostin, 2018; Rodionov & Rudskaya, 2017). With this in mind, the purpose of this study can be formulated as follows: to determine the nature of the impact of information technology on the economic system for the formation of innovative susceptibility of the national economy and its primary economic entities, especially – business entities that actively use all the capabilities of information technologies.

4.1. The development of the theory of economic systems

The study will allow the authors to make a certain contribution to the development of the theory of economic systems and the theory of managing of entrepreneurial structures from the standpoint of innovative development. On this basis, a set of interrelated recommendations on the transition of the economic system to the innovatively susceptible type should be developed. Such recommendations will make it possible to more accurately determine the share of innovative production in the structure of industry, as well as draw conclusions about the innovative orientation of the economy as a whole. This can be used in the process of development of new technologies of state administration in order to maintain the most acceptable balance between national competitiveness and the competitiveness of individual innovatively oriented entrepreneurial structures.

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4.2. The problem of monitoring and minimizing the risks of informatization of the economic system

The most important issues in the process of informatization are related to risks. This is due to the dynamics of progress in the field of information technologies, which are developing so rapidly that in some cases emerging threats and risks exceed the expected positive effects. This is a complex problem that requires an urgent solution, both at the level of users of information technologies and within the entire structure of the economic system, more precisely, institutions ensuring its effective functioning, development and protection (Morozova et al., 2019). Thus, the tasks in the field of theory and practice of managing the process of using information technologies should be aimed at maximizing their positive impact with controlling and eliminating possible negative effects. Let us assume that this should be based on the construction of an innovatively susceptible economic system capable of providing reliable protection to business entities and the state as a whole.

5. Research Methods

To understand the essence of the process under study, it is necessary to determine a number of the most appropriate research methods. To do this, it should be established what the digitalization of the economy is and what are its expected consequences in terms of the impact on various areas of the national economy. The authors of this article proceed from the fact that the digitalization of the economy is a systemic process of implementing information technologies in almost all areas of the economy, ensuring the effective functioning of economic relations between various entities. At the same time, in the framework of digitalization the number of participants in production chains between producers and consumers should be reduced in order to maximize the full and high-quality satisfaction of economic interests, not only of individual economic entities, but of society as a whole. It should be emphasized that information technologies provide the high level of personification of the production process, making it less and less massive and increasingly reflecting the interests of individual consumers. Against the background of the movement towards the individualization of production and consumption in the modern world, we are observing an explosive growth of relevant enterprises and the demand for goods and services produced by them (Dubovik, 2019; Kwilinski, 2018). Of course, the vast majority of such enterprises are innovatively oriented. In this context, the consumers themselves should also be examined from the standpoint of determining their individual innovative susceptibility and readiness to consume innovative goods and services. Even taking into account the fact that the significant part of consumers today cannot get full advantage of all the opportunities that innovative products and services provide them, changes are taking place quite rapidly (Saeed, 2019).

It should be clarified here that we have identified a disproportion between the opportunities of innovative enterprises that actively use information technology in their work and the readiness of consumers to use them correctly and efficiently. Moreover, the consumer group is heterogeneous. In particular, households can be conditionally divided into at least three categories (when analyzing a competitive market or a specific product, this gradation can be significantly expanded):

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- conservatives, with difficulty accepting new technologies and innovative properties of goods and services;
- active users who enjoy everything new;
- intermediate group, which is ready for a new one, only if it does not require considerable intellectual efforts, time and financial expenses from them.

As for consumers such as firms, a more sophisticated classification approach is required. The fact is that the demand of enterprises for innovative goods and services can be considered in the following areas:

a) the demand for factors of production required for participation in the further process of creating goods and services;
b) the demand for goods and services of a company that is integrated in the production chain of another company (other companies). In the case of global production chains, demand-driven factors are becoming more complex (Bélanger et al., 1994). This, among other things, also involves taking into account some national differences;
c) the demand for goods and services, in relation to which this company is considered as the final consumer (similar to household).

In addition to this, one more, non-standard and interesting approach should be considered. It is associated with the assessment of the identity of the owner or top manager of the company. As practice shows, if the first person of the company is an active user of new technologies, then they will be widely introduced in the activities of the company (and otherwise).

A more complex approach is used in the analysis of the state as an economic entity. Here it is also necessary to distinguish between the concepts of the state. On the one hand, the state can be regarded as a national economy, and on the other hand, as a managerial institution. In a managerial context, it is necessary to conduct a study of the scope and directions of new technologies used by the government. Here you can see an analogy with the work of the management of an individual company (Vishnever et al., 2019). In general, today we could interpret this as the work of electronic government. In the context of understanding the state from the perspectives of the national economy, it is necessary to analyze the activities in the field of informatization carried out by all economic entities, sectors, territories, both individually and in combination. The role of the state in this process is to support and stimulate the development of economic entities through applying various economic and administrative tools in order to increase the level of competitiveness and economic security. Thus, the solution to this problem involves the use of an extensive list of research methods. In the aggregate, all of them are aimed at building an effective model of transition to an innovative type of economic system development using information technologies.

6. Findings

The analysis shows that in modern conditions, the basis for the successful development and competitiveness of any business entity, as well as the state as a whole, is the spread and active introduction of innovations. Therefore, this process should become the key to the development and implementation of the state economic policy, including an effective state innovation policy. This direction is the most

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important today for countries with developing economies, as well as for countries whose significant part of GDP is generated through the export of natural resources, and Russia cannot be an exception here (Abaas et al., 2018).

6.1. State innovation policy and the specifics of its formation in a particular country

In the context of increasing requirements for the level of competitiveness, economic growth and security of countries, state innovation policy should become a link providing integrated solving the problems arisen and ensuring significant progress in the development of science and technology, educational and social spheres. Based on domestic and foreign experience, as well as on the results of scientific studies conducted in this direction (Çelik, 2020; Kharlamov & Kharlamova, 2018), it is possible to describe the process of setting goals in the field of forming an effective state innovation policy and the prospects for its implementation. At the same time, our attention should be paid to the need to identify specific factors for each particular country, the effect of which humpers the development and implementation of innovations. If we are talking about Russia, we can include in the list of such factors:

1. The continuing focus on the development of the raw materials sector and its corresponding infrastructure, including the sphere of research and technological development;
2. Underestimation of the role of fundamental science, which is expressed in a slight increase in funds allocated for scientific research (with the exception of those that can be applied in the raw materials sector). This is most clearly manifested in the imbalance between the financing of basic and applied science, and in general in the underfunding of scientific research;
3. The continuing aging of scientific and pedagogical personnel in universities and research organizations. The share of young scientists and teachers is still insignificant, and the material base for research and teaching (with the exception of a small number of universities) lags behind the requirements of competitiveness in the field of science and education. This especially complicates the work in new scientific areas, including information technologies and technologies 4.0;
4. The contradiction between the requirements for the quality of education and the share of people with higher education, as well as applied teaching technology and teacher qualifications;
5. Non-compliance of the current regulatory framework with the requirements of innovative development. This is manifested in the fact that the implementation of innovative projects in a number of areas, including medicine, pharmacology, biology, is faced with numerous restrictions that require significant time costs for coordination and obtaining permits. All this constrains the investment in such types of innovative projects, especially if it is associated with breakthrough technologies. Because of this, it is more common today to invest in improving existing technologies and adapting them to changing consumer requirements;
6. The inefficiency of cooperation networks between science and practice, as well as the lack of information on existing developments among entrepreneurs. As practice shows, the current grant support is not always effective, since it is often aimed not at developing an innovative economy, but at solving current problems and lobbying the interests of individual research centers and corporations.

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6.2. Ranking countries based on the Global Innovation Index

There is no doubt that the list of the above factors could be continued. However, in the framework of this study, it is necessary to concentrate on the factors that are most important or problematic for the Russian economy. This will allow us to provide a more reasoned approach to the search for tools to solve existing problems in the innovation sphere. At the same time, you can focus on the data of the annual Global Innovation Index rating. So, the rating data for 2019 shows an estimate of 129 countries.

In this ranking, Russia took 46th place. This indicator coincides with the level of the previous year (2018), while in 2017 our country was at 45th place, and in 2016 – at 43rd place. The position of Russia in the ranking compared to the leading countries (Table 01) demonstrates the presence of many unsolved problems in the innovation sphere.

Table 01. Global Innovation Index ranking (2019)

Country/Economy	Score (0–100)	Rank	Income	Rank
Switzerland	67.24	1	HI	1
Sweden	63.65	2	HI	2
United States of America	61.73	3	HI	3
Netherlands	61.44	4	HI	4
United Kingdom	61.30	5	HI	5
Finland	59.83	6	HI	6
Denmark	58.44	7	HI	7
Singapore	58.37	8	HI	8
Germany	58.19	9	HI	9
Israel	57.43	10	HI	10
…				
Montenegro	37.70	45	UM	5
Russian Federation	*37.62*	*46*	*UM*	*6*
Ukraine	37.40	47	LM	2
…				
Niger	18.13	127	LI	17
Burundi	17.65	128	LI	18
Yemen	14.49	129	LI	19

Source: The Global Innovation Index (2019)

When ranking countries, they are evaluated by such indicators as the development of technology and the knowledge economy, the development of the domestic market, human capital and science, business development, the development of creative activity, etc. Based on a systematic approach to assessing these indicators, we can detect the negative impact of factors that are specific to our country and hamper the development and implementation of innovations

6.3. Correction of the state innovation policy of Russia

Based on the assessment indexes included in the Global Innovation Index (taking into account the factors reducing the dynamics of innovative development of Russia), the correction of state innovation policy should be carried out in two directions:

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1st. To ensure stable growth of the country's positions in the indicated rating;

2nd. To monitor the innovative potential of Russia and develop a strategy for promotion of our country on the world market of innovative and high-tech products (Kharlamova, 2018).

In practice, these two areas can be separated only for research purposes, and work on them should be comprehensive. This is possible if the model of economic system is maximally susceptible to innovation and provides a transition to a new stage in the development of an innovative society.

6.4. Formation of an innovatively susceptible economic system

Building a more advanced economic system requires a certain readiness of society for transformations, on the one hand, and significant intellectual and financial costs, on the other hand. Considering that any state, in any time period, lives in conditions of limited financial resources, this issue requires a separate study (Bril et al., 2016).

The state is obliged to spend a significant part of its budget on the development of innovations, the formation of relevant institutions, as well as an increase in the share of innovation-oriented economic entities and the goods and services they produce. This implies the maximum support and stimulation of innovative activity ensuring the construction of an innovative society (Vertakova & Plotnikov, 2016). Obviously, we should start with a policy in the field of improving human capital. All people, especially holding leadership positions in the state administration system, should not only actively use all the capabilities of information technologies, but also have innovative thinking.

No less important is the implementation of a scientific and technical policy in the following promising areas:

- applying the capabilities of universities in conducting research in the field of developing of innovative technologies and final innovative products (including the managerial sphere and socio-economic systems);
- formation of educational and scientific clusters and startups that ensure the organization of innovative industries in a relatively small territory on the basis of cooperating with scientific institutions;
- strengthening of integration into the international scientific and innovative space. In this context, we should focus not only on the development of innovative approaches to mining (although this sphere is very important, first of all - efficiency and environmental friendliness of field exploitation), but on the implementation the most complex projects in the field of digital and critical technologies and involving a combination of efforts of many scientists from different countries;
- modernization of the existing infrastructure and institutional environment, ensuring the transition to a new model of the economic system.

7. Conclusion

As the study showed, solving problems associated with the transition to an innovative type of development is impossible without building an innovatively susceptible model of the economic system.

This is influenced by various internal and external factors, the significance (and even the direction of the impact) which over time can transform. Based on this, all managerial and regulatory actions should be carried out within the framework of an effective, and at the same time flexible, state innovation policy, taking into account current trends, as well as foreign and domestic experience in the field of information technology development.

Features of modern information technologies, along with the dynamics of their distribution and penetration into the life and work of all business entities, lead to the transformation of human behaviour and way of thinking of individuals. Underestimation of this specificity can carry hidden dangers, the consequences of which will negatively affect the innovative development of our country and its place in the world. All this in aggregate actualizes the process of formation of an innovative society on the basis of principles corresponding to the new model of the economic system.

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