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# THE IMPACT OF "INDUSTRY 4.0" ON ECONOMY AND PRODUCTION

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### *Abstract*

The article discusses current issues about the prospects and features of the developing the new concept "Industry 4.0". The study highlights characteristics and specific features of the development of technology, the manufacturing sector and socioeconomic relations influenced by the fourth industrial revolution. Besides, it indicates the difficulties and problems that business entities, countries and regions, as a whole, have to face in implementing the achievements and developments of Industry 4.0. The author pays special attention to economic and production aspects, as well as changes in the corresponding systems in the context of radical technological transformations. In particular, when markets become oligopolistic, the role and importance of small and medium businesses increase significantly, and the problems of social inequality and tension fester due to growing unemployment and the need for highly qualified personnel. The author reveals the features of the competition for technology, investment, markets, territories of distribution of productive forces. The focus of attention is also on the main revolutionary trends in industrial development related to the launch of the innovation and technology cycle initiated by Industry 4.0. The article offers specific actions and measures to implement these trends into reality. Considering the results obtained, the author outlines the priorities in the advanced production technologies of the EU, USA, China and Russia. The development of Industry 4.0 entails not only ample opportunities but also new risks for the development of production and the economy as a whole.

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## **1. Introduction**

The characteristics of scientific and technological development resulted in prerequisites for development in the field of modern economic and production systems. After the crisis of 2008-2009, almost all developed countries of the world have revised their views on the industry role and made it the main tool for economic growth (Dastbaz & Cochrane, 2019; Liu et al., 2019; Schreder et al., 2019). Since the beginning of 2016, these countries are increasingly shaping government policies aimed at developing the key factors of the fourth industrial revolution announced at the International Economic Forum in Davos. According to the Swiss economist, founder, and chairman of the World Economic Forum Klaus Schwab, it will result in a blurring of the technological framework, the constant reforming of technological and production networks.

## **2. Problem Statement**

Supporters of integrated production implemented within the framework of Industry 4.0 and provided for the accelerated introduction of cyber-physical systems, or CPS, in factory processes, believe that it will change the definition of human labour. This is due to the fact that machines can perform monotonous, routine operations in production with much greater efficiency than people, as a result, linear processes will be mostly automated. Workers, instead of tough, repetitive, hard, dangerous work, will perform tasks that require creative, integration and non-algorithmic efforts.

Based on estimates at the World Economic Forum, the transition to digitalization has significant potential for entrepreneurship and society as a whole and over the next decades could represent over \$30 trillion in global economic revenues (Knapčíková & Balog, 2019).

## **3. Research Questions**

However, the establishment of Industry 4.0 is a complex, multifaceted and time-consuming process that involves overcoming barriers between people and will entail cardinal changes in the global economy and the way people live. First, we are talking about the production and economic consequences of the fourth industrial revolution and recall the law of correspondence discovered by K. Marx on the level of developing the productive forces of society to the nature of production relations.

In this context, we will agree with Klaus Schwab who argued that the upcoming changes will be so significant that, in terms of the prospects for the development of human history, there have never been more encouraging or, conversely, potentially more dangerous times. In his article, the economist emphasized that we are on the verge of a technical revolution that will completely change our way of life, work and communication. We are waiting for the largest in scale and complexity transformation in the history of mankind. We still don't know how exactly this revolution will happen but it's already clear: the response will be appropriate on the scale of the revolution itself; all participants in global politics must change, all players, from private to public sectors, the academic world and society itself must change, cardinal transformations await economic and production systems (Schwab, 2017).

#### **4. Purpose of the Study**

Already, today you can observe the process of merging the digital, physical and industrial worlds. The acceleration of innovation has spurred the emergence of new types of economies: information economy; innovative economy; a new economy; knowledge economy, within which the business/process models of competitive enterprises fundamentally change.

Based on this, it is necessary to analyse in advance the opportunities and threats that the fourth industrial revolution will bring for economic and production systems, to develop action plans to maximise positive and minimise negative processes which generally determines the relevance of the scientific article.

#### **5. Research Methods**

Many scientists have devoted their works to the study of the prospects and problems of industrial revolutions, in particular, the third and fourth: Toffler E., Schwab K., Rifkin J., Hutch F. Acemoglu D., Robinson J. Rostow A. V., Drucker P., Galbraith J., Schumpeter J., Aron G., Koval S., D. Bell. It should be noted the scientific contribution to the study of future socio-economic development and domestic scientists: Antonyuk L. L., Berezina A. Yu., Geys V. M., Grinkevich S.S., Danilishina B.M., Ilyashenko S.M., Libanova E.M., Nikolaeva E.B., Seminozhenko V.P., Fedulova L.I., Khvesik M.A. and etc.

The following scientists are engaged in the development of the conceptual apparatus of the institutional palette of systemic transformations “Industry 4.0”: V. Vovk, V. Galasyuk, I. Guzhva, A. Zhmerenetsky, K. Kraus, A. Maksuta, Yu. Pivovarova.

#### **6. Findings**

Despite significant developments on the problems under study, the issues of the influence of the fourth industrial revolution on the welfare of innovative and backward industries and sectors of the economy remain insufficiently covered in the scientific literature.

Also, a significant number of problems relating to the development of the concept of Industry 4.0, the analysis of positive and negative changes that this industry brings for the economy and production, the content of the types of products and services that it produces and provides, require further in-depth analysis.

Thus, the purpose of the article is to analyse the features of the implementation of the fourth industrial revolution in production and economic systems, consider key impact factors and points of contact, identify prospects for implementing business development strategies based on the results of using the Industry 4.0 concept.

First, the impact of the fourth industrial revolution on the economy manifests itself in the fact that key world leaders have developed and approved digital agendas determining the direction of economic systems in the context of introducing Industry 4.0 technologies. Thus, digital initiatives, strategies and programs have been approved and implemented in the European Union (more than 86). Experts argue that the fourth industrial revolution will occur faster and larger than previous revolutions entailing systemic, consistent transformations, and will change the entire structure of the economy qualitatively and quantitatively (Nikiforov & Tarasov, 2018). Industry 4: 0 may result in a gradual change in the leadership core of the global system in terms of the development of innovative technologies, products, management

systems and the accumulation of a significant part of added value. Today, North America and the EU are leaders in the field of innovative economies, and other countries of the world are starting to catch up with them. The assessment of China's innovation, for example, increased from 35% of the EU level in 2006 to 49% in 2018 (Xu et al., 2018).

Scientists predict that the leaders of the economy will be the United States, Japan and European countries, but unexpected options are possible. They are talking about developing and industrially backward countries which in the case of the rapid development and spread of innovative technologies will have all the prerequisites to join the team of leading countries and compete with them.

Automation and robotisation of production can result in a relapse of production in developed countries and solve the problem of unemployment, but it will make poor regions even poorer.

Competition between countries will intensify for creating the most favourable conditions not just for the development of any business, but for the development of industries based on automation, robotics and intellectualisation producing goods and services that are in high demand internationally (Kiselev et al., 2018). To win this hypercompetitive struggle of the era of the fourth industrial revolution, countries not only must have unique assets for dynamic and high-quality production of new knowledge and technologies but can also translate them into concrete products and offer them on world markets as soon as possible. The result will depend on the speed of reaction to changes in the environment, and time will acquire the status of one of the decisive factors of competitiveness.

Countries will participate in a hyper-competitive struggle for limited investment resources, the material basis for the implementation of the latest technologies. In modern global markets, in particular, financial markets, the speed of capital flows will be equal to the speed of information flow and far exceed the speed of its comprehension. Countries will struggle to attract foreign investment and to place links of global value chains on their territories, stimulate the development of clusters with smart specialization, unique in the global market.

The undoubted economic effect of the development of the Industry 4.0 concept is the increased influence of small and medium-sized businesses on the global economy. If the leaders of powerful and successful states controlled the first wave of globalization in the 19th and early 20th centuries, and transnational corporations controlled the second wave, then the third wave which falls precisely on the spread of Industry 4.0 is completely in the hands of small and medium-sized companies. Given this, Alibaba founder Jack Ma presented his concept at the Davos forum in 2018 - "30-30-30." Its meaning is as follows: over the next 30 years, the world will be changed by people under the age of 30, and to companies with less than 30 employees. This trend opens up new opportunities for the development of small business in any country in the world (Frank et al., 2019).

The explosive development and diffusion of new technologies, their penetration into all spheres of human activity, provokes fast and deep transformations of the architectonics of market economies, business models and organisational structures. Markets acquire all the features of oligopoly which, according to the author, is associated with two trends.

On the one hand, this is facilitated by the fact that in the conditions of the fourth industrial revolution, small and medium-sized enterprises can drop out of the system of scientific and industrial cooperation of




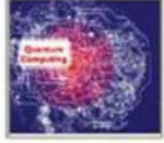







manufacturers of high-tech products: large multinational corporations and multinational corporations, due to a significant increase in the cost of ensuring information security in the new conditions, reduced flexibility and loss of independence on a strategic scale. TNCs will be forced to assume the risks associated with the violation of the integrity of the established cooperative ties. It will lead to the consolidation of business units and increased concentration of production. On the other hand, the development of information technologies, as part of the concept of Industry 4.0, is changing the conditions for the functioning of individual markets, more and more globalising them. National monopoly organisations will enter into intense competition with other similar entities (Belova et al., 2018).

However, absolute monopolisation of the global market is practically impossible, since the ability of one company to satisfy all global demand is unlikely. Besides, information technology will provide the needs of any consumer outside the national borders of his country. The modernisation of transport, logistics chains, the delivery of goods from anywhere in the world becomes not only affordable but also very fast in time.

It should be noted that, from an economic point of view, the fourth technological revolution will increase inequality in all its planes: social, professional, material, etc, and will lead in the short term to even greater stratification of the population, technology owners and developers will be rich, and low skilled personnel will be poor.

Today, many countries of the world, and especially developing ones, note the fact that the middle class has disappeared. According to the World Economic Forum, more than 5 million jobs will disappear as a result of the development of genetics, robotics and other technological changes (Kumar et al., 2019). In general, about 47% of vacancies in the US today are at risk of extinction caused by changes associated with automation and the transition to a digital environment. The most impressive is the following figure: 65% of first graders of 2017 will work in completely new jobs that do not even exist (Bendul & Blunck, 2019).

Of course, production changes have inextricable links with economic transformations. Thus, robots and digital technologies will form a new type of production, and technologies combining the physical, biological and digital world will form a new type of consumption. This will lead to even greater specialisation in the service sector by creating highly focused business platforms that will bring together certain groups of people by horizontal models of interaction. Goods and services will become high - quality and cheap, but this can reduce the cost of human labour. Figure 1 presents the forecast for the development of production and related technologies as a result of the introduction of the Industry 4.0 concept.

Deep Learning - Image Processing 	All-in-One Data Processing Specialist 	Human-Machine Collaboration 	Quantum computing 
Handwriting and voice recognition 	Home and service robots 	Neuromorphic Computing 	Emotional robots 
Natural Language Processing, Big Data Use 	Unmanned vehicles 	Brain-computer interface 	
2015-2020	Next 5 years	Next 20 years	Future

**Figure 01.** Prospects for the development of production due to the introduction of Industry 4.0 technologies

The above confirms the fact that further industrial development will involve the implementation of three related transformations that can launch the next innovative technological cycle changing the technological paradigm. The content of these transformations is presented in Table 1.

**Table 01.** The main revolutionary trends in industrial development related to the launch of the innovation and technology cycle initiated by Industry 4.0

Transformations	Content
A revolution in the design and organization of production processes	Total technological and organizational reengineering based on the digitalization of production processes
New materials	Its implementation in an automated production process, integration with product components
Smart environments	The expectation of their mass introduction is on the horizon of 2020-2030. Market launch of Smart software products which is in full swing.

According to the forecasts of authoritative world institutes, (OECD, World Bank) and international industrial associations, as well as research scientific centres, the launch of these three revolutions in industrial production by 2030 will only be through the introduction of advanced production technologies called disruptive emphasizing their revolutionary effect on the structure of production (Yuanyuan & Sheng-Feng, 2019).

So, in the next 10-20 years, in the context of implementing the achievements of the fourth industrial revolution, the industrial production of countries, and especially developing ones, will be forced to solve a whole package of fundamental problems related to:

- obsolete raw material base: lack of materials, their high price, limited design capabilities, which requires new structural and functional materials;
- the increasing complexity of production: the complication of the organisation of technological chains, the complexity of products and rising costs of production, the need for a high-quality engineering leap and in the management of production processes in the direction of non-linearity;
- outdated industrial infrastructure: the high cost and inflexibility of innovative systems will require increasingly new, flexible and open infrastructures.

## 7. Conclusion

Summing up the results of the study, we can draw the following conclusions.

Industry 4.0 is the industrial production of the future creating today. The fourth industrial revolution focuses at ensuring the interaction of all participants in the value chain while simultaneously integrating them through a single global network - the industrial Internet (the Internet of things at the industrial level). Industry 4.0 contributes to the emergence of new technologies, such as artificial intelligence and robotics, virtual and augmented reality, additive technologies, blockchain and accounting technology, biotechnology, etc. The countries that have a developed production structure and potential for its development, in particular, Germany, the USA, South Korea, China, Japan, Sweden, etc., are most prepared for the transition to Industry 4.0.

For the economy, the fourth industrial revolution opens up broad growth opportunities for business entities and simultaneously poses completely new challenges. The most important challenge of our time is the speed of change and its management. Relations between countries, markets are changing, economic relations are being transformed, representatives of medium and small businesses, much more efficient in producing and implementing new technologies, are replacing the dominant global giants, TNCs. Successful market representatives must constantly upgrade to quickly adapt to the fourth industrial revolution.

The governments of national states, regardless of their place in the global competitiveness ratings, are constantly forced to search for ways and tools for technological renewal, and, accordingly, for geopolitical survival.

In general, to overcome the challenges, to use the opportunities of the Fourth Industrial Revolution, to preserve the basic principles of sustainable economic development, business entities, society as a whole, governments and countries should be oriented towards:

- the search for additional funding reserves for industrial high-tech segments that are a priority for Industry 4.0 including the development of projects in the context of obtaining grant financing, the creation of a fundraising team;
- the expansion of export activity of Industry 4.0, since potential developments in this segment of the economy, are many times greater than the capacity of the domestic market;

- the strengthening role and importance of the state as the main stakeholder in the development of Industry 4.0.

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