PROBLEMS OF STRATEGY DEVELOPMENT, FINANCIAL AND ECONOMIC REGULATION IN INDUSTRY

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DEVELOPMENT OF SMART INDUSTRY AS AN EFFICIENT WAY TO IMPLEMENT THE POLICY OF NEOINDUSTRIALIZATION IN THE WORLD

The paper reveals modern trends of development of manufacturing systems, based on the principles of the Forth Industrial Revolution and linked with transition to the smart industry principles.

Smart enterprise is considered as the key primal segment of smart industry construction, which characterized with the possibility of control and tracking of industrial tools and industrial staff functioning through the Industrial Internet of Things. It also allows using data, collected for increasing productivity of labour, modification of technological processes and production quality.

Nowadays a number of countries all around the world formatted their own strategies of national mechanisms of smart industry's incipience. At the same time, there are some similarities and differences in the formatting of principles and implementation of approaches that can be observed in this context in leading industrial countries.

German's concept "Industry 4.0" was formed with the direct participation of governmental structures, scientific and business circles and considered the development of national industry, but not the global breakthrough. Implementation of this concept is directed on supporting of small and medium national manufacturers. In the USA the Industrial Internet Consortium was created as a non-commercial organization with open membership. Promoting the concepts of "sharing" and "open platforms", Consortium considers its main task to be an optimization of profitable assets with emphasize on total financial returns. Chinese "Made in China 2025" strategy was formed upon the initiative of the government and assumed its leading role in the management of economy and transformation processes. The strategy defines an ambitious task as the main goal – to turn China into the world leading manufacturer and high-tech state through the increasing of "intellectual" smart industry capacity by 2025.

Different appraisals of the abovementioned countries' prospects of the programs implementation show that today progressive businessmen no longer believe that transfer of production capacities to countries with cheap labour is a reliable way to succeed. This is due to the fact that goods have to fit the configuration of manufacturing, directed on satisfying the individual consumers' needs and requests. From now on, the industry can become more localized. On the other hand, development of a smart industry means qualitative leap in cooperation and coordination of enterprises, linked through the global computer networks with researchers, developers, suppliers, distributors, end-users, etc. all around the world.

Ukraine must form its own program of national manufacturing transition to "smart" grounds, because the analysis of foreign experience, conducted in the paper, reveals an inex-

pediency of “blindly copying” the foreign strategies. Given the current state of affairs, combined model of building the smart industry can be congruent one for Ukraine. This model represents a combination of profitable assets optimization (according to the US experience) and support of national small and medium businesses (according to the German experience). The latter can provide fast integration into world smart environment, development and export of the necessary advanced technologies and products for the network industry under existing circumstances.

Keywords: smart industry, Industry 4.0, Industrial Internet Consortium, Industrial Internet of Things, smart factory, cyber-physical production systems, information and communication technologies, big data.

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In April 2011, on the annual industrial Hannover Fair (Federal Republic of Germany), the basic provisions of the new industry development concept «Industry 4.0» were presented. The concept was initiated by the German Academy of Technical Sciences, German Research Center of Artificial Intelligence and the Federal Ministry of Education and Research of Germany.

In essence, this concept is the answer to the demands of time concerning the creation of new world economy architectonics after the global financial crisis of 2008-2009. This crisis emerged, inter alia, due to the reduction of the share of real economy (manufacturing area) and increase of the share of services.

The approach, proposed in the concept, assumes the increase of industrial production competitiveness through the integration of Cyber Physical Systems (CPS) principles in manufacturing processes of enterprises through the Internet-linking of manufacturing equipment, machines, constructions, and warehouses. The implementation of the Industrial Internet of Things (IIoT) and personalizing of manufacturing determined as the most important part of the Fourth Industrial Revolution, which is aimed to ensure the new quality of smart industry as the foundation of the world economy smart growth, based on knowledge, environmentally friendly technologies and product innovations.

According to McKinsey & Co, by 2025 the IIoT technologies will cover from 80% to 100% of the world processing industry [1]. Thus, no wonder that the problems of smart industry become the theme of numerous academic papers, analytical materials, different reviews and international institutes' and organizations' reports all around the world (e.g. [2,16]). At the same time, the number of Ukrainian publications on this topic is not that significant. Some issues of smart specialization and Industry 4.0 are examined in the papers by I. Egorov [3], Y. Ryzhova [4], I. Matuchenko [5], V. Skitsko [6], etc. A number of papers by the specialists of the Institute of Industrial Economics of NAS of Ukraine are devoted to problems of further development of the national industry on the “smart” principles. Among other problems, the actuality of the Ukrainian economy transition to neoindustrial development model with the aim of increasing the level of social and economical quality are substantiated in them. Also, some works analyze the current state of Ukrainian industry and determine the key directions that should be taken into account when creating the new strategy of its development [7], identify features of industrial smart enterprises and smart industry and obstacles that should be overcome for national industry renovation using IIoT [8]. In some papers, the authors describe the problems of complication and robotization of Ukrainian

manufacturing, in conditions where the industry is characterized by considerable physical and moral depreciation of productive assets and uncongenial investment climate [9].

However, in contrast to many advanced economies of the world, the integral concept of smart industry formation and development is not developed in Ukraine yet. That is why various aspects of this important issue demand further special research to consider not only the best world practices, but also to take into account technical, technological, structural, institutional features of the Ukrainian industry.

Respectively, the *purpose* of this paper is to analyze the processes of smart industry development in the leading countries of the world and to define the prospects, caused by this development, in the whole world and in Ukraine in particular.

The primary link of the smart industry is a smart enterprise, characterized with the possibility to control and track tools and staff by mean of IIoT and to use data collection for the improvement of productivity, technological processes and upgrading the quality of production.

Smart enterprise can also be considered in terms of hardware interaction, primary data, software, artificial and human intelligence. Information, received by sensors, log-files and searching robots from physical systems to computer networks is collected, transmitted, pre-processed, stored, visualized, analyzed and used by highly qualified staff for industrial products and manufacturing process modeling.

Practical implementation of such cooperation with real-time processing of big data is concerned in [10]. As was noticed in [11, p. 654], big data technologies describe new generation of technologies and architectures, intended to enrich economical profit from the very large volume of different data with the help of high-speed capture, finding and/or analysis. This definition describes four specific features of big data – volume, variety, velocity and value. As a result, "4Vs" definition is widely used for characterizing big data [12].

For understanding these data the following instruments of advanced analysis are used – intellectual analysis, predictive analytics, object-oriented analysis, real-time scoring, prognostic modeling, optimization, etc. [12, p. 675-677; 13]. Factory managers can use developed («upgraded») analytics for deep immersion in historical data about manufacturing processes. This allows defining and optimizing the factors that have the biggest impact on the final results. The majority of global commodity producers in the wide specter of industries and geographic locations already accumulated a lot of real-time data, collected during the stage of primary manufacture and on market. Using the integration and analysis of previously isolated arrays (including non-structured and barely-structured [11, p. 654]), they have the possibility to offer new important ideas [13]. All gained information is used for data-driven decision making (DDD) [14] both in the area of current management influences and in strategic management of various industrial systems [15, p. 9]. However, today creation of a safe network is still a rather urgent problem. Such a network would guaranty invulnerability of integrated with the Internet physical systems and related manufacturing processes from cyber attacks.

Manufacturing enterprises (companies) in future will probably need to withdraw from their own production of spare parts and to increase the number of suppliers. They also need to base their work on Just-in-Time and Just-in-Sequence principles. Accordingly, these would demand the high level of coordination and cooperation, when carrying out processes, based on management decentralization and stop constant

attempts to standardize and to plan developing production processes and chains.

As it was mentioned above, a number of countries with advanced economies formulated their own strategies about the main directions and mechanisms of implementing smart industry at national level. At the same time, it is worth paying special attention to similarities and differences of the strategies of these countries – industrial leaders, located on different continents – Germany, the USA and China (that in the nearest future will play the main role in the building of a new model of economic development – the smart growth of the world economy).

Germany took the course at modern technologies unification and IIoT and became the leader among the EU member-countries in the area of "Industry 4.0". Interest in implementation of new technologies and the corresponding receipt of potential dividends was first demonstrated by such leading industrial corporations as Siemens, ThyssenKrup, Robert Bosch, and BASF. According to some estimations, the German business can invest in IIoT infrastructure up to 40 billion euro per year till 2020 [16].

Taking into account that smart industry is much more than stand-alone enterprises and their products, the big German corporations traditionally allocate significant amounts of funds to provide fundamental and applicable R&D, aimed at ensuring the development of smart industry. This development should be based on collaboration with researchers, developers, suppliers, distributors, consumers, etc. through the information and communication technologies – the ICT (mobile Internet, IIoT, cloud technologies and others), which will result in creation of a global digital platform for coordination and increasing of active participation of all partners in separate chains and in the whole global network.

Today Germany relies on the formation of bases of the smart industry in its traditional activities (firstly – in manufacturing industry, mechanical engineering and automotive industry), which provide it a leading place amongst the EU and world economies; at the second stage – in traffic and logistic complex and directly related to them manufacturing of specific equipment, complex automated, integrated and cyber-physical manufacturing systems, sensors of pneumatic control systems, actuators, etc., and, at the third place, in the sphere of information and communication technologies.

Nowadays, a lot of German manufacturing enterprises are the world leaders in the abovementioned fields of economic activity. Their further development in the context of creation of smart manufacturing should retain leading positions of Germany in international markets of products' manufacturing that will remain volatile and uncertain for a long time. Increasing the speed and flexibility of reaction to customers' demand can reduce the negative impact of high labour costs, which is comparatively high in German manufacturing industry and can amount up to 20 % of general costs [17, p. 14].

New technologies are actively implemented in German industry (Embedder Systems, Smart Factory, Robuste Netze, Cloud Computing, IT-Security), that stimulates the inflow of significant investments to transition to smart industry principles in engineering, automotive, electrical engineering, chemistry, ICT, agriculture areas. All this greatly increases the attractiveness of Germany as a location for smart businesses.

On its part, the state is taking measures to stimulate the use of digital technologies in the national economy. In particular, the country has developed and approved at the state level the "Information and Communication Technology Strategy" [17, p. 16], which suggests the expansion of

the necessary infrastructure, accelerated development of digital technologies and their implementation into production, solving the issues of cyber-security.

In March 2015, the Federal Ministry of Economics and Energy and the Federal Ministry of Education and Research of Germany created the biggest network platform in the country – Plattform Industrie 4.0, – which took into account the positive experience of functioning of such communicative platforms of business unions as BITCOM, VDMA and ZVEI. Architecture, norms, standards of research and development work (SRDV) is among the traditional blocks. The special attention is paid to such questions as network system safety, law, education and qualification upgrade, interconnection of governmental, business, scientific and social representatives. One of the main platform tasks is the coverage of existing pilot projects and their consistent implementation in business model. As at the end of 2015, the platform already united more than 7 thousand enterprises [17, p. 17].

German experience is already studied and implemented by some other industrialized EU member-countries, which adopted similar state programs [2, 17]: Netherlands – Smart Factory, France – Alliance Industrie du Futur, the United Kingdom – High Value Manufacturing Catapult, Italy – Fabbrica del Futuro, Belgium – Made Different.

In the *USA*, the establishment of the Industrial Internet Consortium TM, IIC (hereinafter, the Consortium) in 2014 by the companies AT&T, Cisco, General Electric and Intel become a significant event [18]. It was founded as a non-profit organization with open membership. The goal of the organization is to help eliminate barriers between different technologies in order to provide maximum access to big data and to improve the integration of physical and digital environment. Consortium will facilitate connection and optimization of resources, operations and data to disclose business values in all industries.

For the USA, just as for Germany, modernization of industrial sector and the unification of digital network of manufacturing equipment with virtual world is one of the key priorities. As the US government assumes, one of the main tasks of its strategy is the reindustrialization and returning the country to the circle of industrial leaders[1]. However, it should be noted, that the approaches and objectives set by Germany and the United States on their way to reindustrialization and the new smart industry building differ significantly.

The concept “Industry 4.0” means the development of German industry and provides, first of all, the national rather than global breakthrough. Its main objective is optimization of manufacturing, work with standards and the orientation on hi-tech landscape. The main focus is on small and medium enterprises. This concept does not deny access to international companies with the aim of obtaining manufacturing components on the condition of their purchase by other companies.

Instead, the Consortium's ideology is "shared use", since it is believed that only by taking on the experience of others, and

[1] In his inaugural speech the new President of the USA D. Trump described this problem as follows: «One by one, the factories shuttered and left our shores, with not even a thought about the millions upon millions of American workers left behind. The wealth of our middle class has been ripped from their homes and then redistributed across the entire world. But that is the past. And now we are looking only to the future. … Every decision on trade, on taxes, on immigration, on foreign affairs, will be made to benefit American workers and American families. We must protect our borders from the ravages of other countries making our products, stealing our companies, and destroying our jobs. Protection will lead to great prosperity and strength.» (CNN. Inaugural address: Trump's full speech. 2017. – Available at: http://edition.cnn.com/2017/01/20/politics/trump-inaugural-address/ [Accessed 24 January 2017]).

not duplicating one another, one can achieve general progress without unnecessary expenses. The instrument of increasing the US companies' efficiency is the global network of Internet, to which almost all the equipment in the world is connected, providing data and feedback.

The Consortium focuses on the development of many areas of economy: industry, energy, medicine, traffic, agriculture, utility services. It sees its goal in optimizing profitable assets, focusing on overall financial returns. Creation of open platforms that can form the future standards and replace formal standardization is also promoted. A distinctive feature of the Consortium's views, which distinguishes it from other similar programs, is the unification of existed objects in one safe production network.

To some extent, it may seem that the US policy (conception of "common use" and "open platforms") contradicts the official statements of the government regarding the revival of the industrial capacity of the country. But in this respect it is worth mentioning that the smart industry tends to a solvent consumer. Game rules, guaranteed by law in the USA (warranty of copyrights, investor's protection, independence of the judiciary, low level of corruption, high level of human development and availability of financial capital, etc.), combined with developed area of SRDV, give vast possibilities of using the advanced international experience in different areas and the good chance to achieve the world leading positions in the development of smart industry to the country.

China occupies a special place among the abovementioned countries that understand the importance of smart manufacturing for its industrial future and have already developed its own policies and programs for development and application of IIoT. In 2015, the government of the country approved a strategic document 'Made in China 2025' (further – Strategy), which points the priorities of Chinese industry on the grounds of modern smart technologies [19, p. 39]. Besides, China anticipates accelerating of the integration of information technology and manufacturing sector with the development of industrial Internet on the foundation of Internet Plus initiative realization. This initiative is essential for the economy, digital economy transformation and for cloud platform building, which promote the expansion of interconnections both within the industrial companies and in manufacturing chains in general [19].

Taking into consideration the features of political system of the country, it is not surprising that the start of smart modernization was given by the Chinese government and the country policy, concerning its implementation, is build on "top to bottom" principle. The strategy has an ambitious goal – China's transformation into the world leading manufacturer and the country with high technologies by 2025. It has to be achieved through the increasing of "intellectual" capacity of smart industry. Special feature of Strategy is the leading role of the government in managing the economy and transformation processes.

Just as with the US Consortium ideology, the tasks of Strategy in China are not limited to the development of industry only, but also include nine priorities: improvement of industrial innovation; the integration of information technology and production; support of Chinese brands; implementation of "green" production; promoting breakthrough achievements in ten key sectors of economy (IT; numerical control tools and robotics; space and aerial production; marine equipment and hi-tech ships; advanced railway transport equipment; energy-saving vehicles and vehicles, that function on new types of energy (renewable); power equipment; agricultural machinery; new materials; biological medicine and hi-tech med-

ical devices); progressive restructuring of manufacturing sector; promotion of service-oriented manufacturing and sector of industrial services; internationalization of production.

With enormous financial, industrial and human capital in the last decade, China is increasing heavily its scientific and technical potential. Realization of significant investments and intensification of the development of its own sphere of SRDV allows China not only to copy EU and US technologies, but also to promote its own (including digital ones). A vivid example of this is the researches of Alibaba Group, Lenovo etc. However, the results of SRDV cannot provide the targeted rate of Chinese economy growth yet. Therefore, Chinese companies use various methods for attracting foreign technologies in their own industrial production, from official[1], to semiofficial and non-official[2] (taking into consideration that the issue of intellectual property rights' protection on the territory of China is still not completely resolved).

To implement the Strategy in practice in 2016 profile ministries and agencies created a fund that amounted 3.05 billion US dollars. The main goals of this fund is investing in advanced sectors of industry, supporting the modernization of traditional sectors of industry and boosting the high technical level of industry as a whole.

It is worth mentioning that the Strategy provides the division of enterprises into three categories: frontrunners, hopefuls and latecomers. The category of leaders include a small group of companies that already apply the principles of smart industry and which are already integrated into and compete on the world markets. The second category is represented by the majority of state-owned and private enterprises and includes the enterprises on the stage of transmission from the Industry 2.0 to the Industry 3.0. These categories of enterprises are the most numerous and form the base for all Chinese industry. They provide the working places to the majority of workers, employed in industry. Investing in re-equipment and implementation of the principles of smart industry in this category of enterprises will be done by the abovementioned fund. The third category is formed by the enterprises with the large share of manual labor, which in the future will lose their positions both in the national and foreign markets.

The hidden impact of automation on the labour market and the shortage of highly skilled personnel greatly reduces the ability and desire of many Chinese enterprises to invest in costly upgrades of equipment. Therefore, the Strategy may fail to reach the goal of the large-scale modernization of production and its transition to the principles of "smart industry". Instead, it has good chances to improve the key components of the country's industry and to create the influent groups of global leaders of smart economic growth of economy in the nearest future. In the long run, given the improvement of living standard of the population (the population of China is larger than the population of any other country), the development of human capital, accelerated increase of scientific and technical potential of the country, etc. contribute to China's transformation into the smart industry leader in Asia

[1] This implies, for example, to the placement on the territory of China their entire production cycle of such automotive giants as Volkswagen, Toyota, Peugeot, Citroen, Honda, Renault, Nissan, BMW; an acquisition of the Swedish concern VOLVO by a Chinese company Geely in 2010; an acquisition of US companies Continental Motors (in 2010) and Cirrus Aircraft (in 2011) by Chineese air company AVIC.

[2] E. g.: Huawei (SecurityLab.ru by Positive Technologies [URL]. – Availaible at: http://www.securitylab.ru/news/tags/Huawei/ [Accessed at: 04 November 2017])

and one of the leading countries in the world.

In *Ukraine, the* situation with formulating and implementation of strategic approaches, concerning development of smart industry is not in its best yet. The reason for that is a well- known issues with innovations, connected with a generally unfavorable investment environment, short rules of behaviour for business entities and low level of investments in SRDV [20]. One of the consequences of such situation, among others, is a weak position of Ukraine in the world ratings, namely – ICT development index (76^{th} place in the world) [21].

Nevertheless, it should be noted that there is already some progress in promoting the development of the smart industry at the initiative of "bottom". In 2016, the Association of Industrial Automation Enterprises of Ukraine together with the Association of Innovative Development of Ukraine founded the movement “Industry 4.0 in Ukraine” [22]. This movement includes nearly 60 companies (the majority of which is well-known brands of ACU and IT), leading system integrators and about 10 customers, including "ArcelorMittal Kryviy Rih". Several strategic initiatives were developed during the work of the Association concerning Smart Factory and Industry 4.0, including creation of new technology parks and road maps for digital transformation of enterprises.

There are other examples of industrial enterprises’ placement by leading world producers on the territory of Ukraine, including Leoni company, whose innovative technologies and decisions is used by world leaders in automobile industry (VW, Audi, Porsche etc.) the leading companies in telecommunication, IT, healthcare and energy fields.

Some examples of application of the practice of building new production on the principles of smart enterprises exist in the field of agribusiness, engineering and pharmaceutical industry.

Regarding the policy of central authorities, the Government of Ukraine has already outlined priority actions in the field of economy for the period till 2020 [23], which can concern the smart industry as well. In addition, at the end of October 2017, the Ministry of Economic Development and Trade of Ukraine announced the launch of pilot project of the smart specialization in industry in three regions [24]. However, as opposed to action plans of the USA, China, core EU countries and other industrial leaders, Ukraine still does not have any strategic document, which would determine smart industry as the national strategic initiative. Ukraine also does not have the authorities, responsible for the forming of such a policy.

Challenging issues of the planned development of smart industry in Ukraine are the questions of limited financial resources for the development of an appropriate infrastructure, lending and holding of SRDV in critical areas for the country. Also, the shortcomings in the system of training and retraining of STEM staff are known. Ukraine has one of the highest education rates in the world, but cannot provide the suitable way of personnel training due to outdated programs and teaching methods in the development of modern techniques and technology areas.

Conclusions

Modern fast-growing industrial cyber-physics systems are already contributing to the increase of labour productivity, meeting the ever-increasing needs of people and improving the quality of life far beyond ever imagined. Obviously, the economic sectors which include mainly standardized manufacturing processes will be radically changed in the upcoming years in the framework of new online models of global value chain’s creation. Worldwide mega-

trends, such as globalization, urbanization, demographic change and transformation of energy sources, will undergo significant changes under the influence of forward-looking development of IIoT as well.

Due to the fact that manufacturers face increasing pressure on costs and volatility of markets and accelerating scientific and technological progress, test phases and life cycles of products become shorter and more informative. Modern world experience of industry development and the innovation tendencies of reshoring testify the fact that material production without "advanced" information is bad and inefficient. However, the information without “advanced” material production is also bad and inefficient, although it is digital technology of manufacturing systems (in conjunction with 3D printing, bio-, nano-, and other disruptive methods and instruments) that mainly define the specifics of what is now called smart industry. It is important to take into account the fact that through IIoT technologies there are no unpromising areas of production today. Every area has enterprises capable (or non-capable) to provide the transition of production according to the smart principles.

Smart enterprises, as components of the smart industry, can be very different in size (small, large, medium) and activity types. These features are not of fundamental importance. The main thing is that all of them represent high-tech flexible cyber-physics production, which provides the accurate adjustment to the individual customers’ demands (delivery time, quantity, quality, costs of production) and are based on the use of big data and advanced digital management methods. So now the top entrepreneurs no longer believe that the transfer of production to countries with cheap labour is an efficient and successful way of doing business. The reason is that now the products must correspond to the production configuration, aimed at satisfying the individual needs and demands of consumers (customers). On the one hand, from now on, the industry can become more localized. On the other hand, development of smart industry means qualitative leap in cooperation and coordination between enterprises, researchers, developers, suppliers, distributors and end users from all over the world through the global computer networks.

In today's world there are different approaches to building of smart industry, that take into account the features of countries’ path dependence, geo-economic positioning, level of R&D, institutional environment etc. Ukraine also needs to consistently develop its own model of IIoT formation and implementation that will be capable to overcome traditional crisis in industry. Besides, as shown by the analysis of the foreign experience in the paper, it is inappropriate to do a "blind" copying of foreign strategies, but Ukrainian government should form its own plan for the transition of national production on a “smart” ground.

Taking into account the current state of affairs, for Ukraine a combined model of building the smart industry, which provides a combination of profitable assets’ optimization (according to the US experience) and the support for the national small and medium-sized business (according to the German experience), can become congruent. Indeed, it is small and medium-sized businesses that are able, under the prevailing conditions, to quickly integrate into the global smart environment, to provide the development and export of the necessary advanced technologies and products for the network industry. The large business differs from the medium and small ones with the possibility to lobby their interests inside and outside the country. That is why the development of large business on the smart principles demands the legislative framework and practical support of "long game rules" to protect property rights, minimize political influence on eco-

nomic processes and exclude rent-based behaviour of dominant owners. All this should ensure the long-term investments in re-equipment of the basic sectors of industry, as well as investments in conducting SRDV.

A priori, it may be noted that the strategic national document on the formation of the national smart industry in Ukraine should contain the following principles, goals, organizational and economic mechanisms:

- definition of smart specialization of Ukraine in the world, taking into account the regularities of the co-evolution of socio-economic, technical, technological, socio-cultural and ecological spatial systems. These patterns are not universal, but depend on the individual circumstances of the country's development in space and time. They are defining the specifics of setting goals and ways to achieve them at this stage;

- formation of a favorable institutional environment for the development of smart industry for acceleration of progressive organizational and managerial, techno-technological and structural-branch transformations through the integration into European Digital Single market and in Digitalizing European Industry [25, p. 9];

- formation of a holistic complex of financial sources and effective lending algorithms for the small and medium-sized enterprises to provide their transition on the "smart" basis;

- a radical increase of the amount of state allocations for holding SRDV and creation the favourable conditions for financial opportunities to involvement of business structures in their implementation;

- development and introduction of upgraded training and retraining STEM-staff programs in accordance with modern technologies, considering the demands of development of smart-industry;

- ensuring the implementation of a set of measures to strengthen national and regional innovation systems, which supports the development of small and medium-sized enterprises for which it is more difficult to compete with international corporations than for the big ones.

But a more detailed substantive content of these proposals requires further, more comprehensive studies.

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РОЗВИТОК СМАРТ-ПРОМИСЛОВОСТІ ЯК ЕФЕКТИВНИЙ ШЛЯХ РЕАЛІЗАЦІЇ ПОЛІТИКИ НЕОІНДУСТРІАЛІЗАЦІЇ У СВІТІ

Розкрито особливості промислового смарт-підприємства (як гнучкого кіберфізичного виробництва, що забезпечує точне налаштування на споживача і ґрунтується на використанні великих даних), а також старт-промисловості. Проаналізовано етапи реіндустріалізації провідних країн на шляху до розбудови смарт-промисловості. Визначено нові перспективи, можливості та проблеми, пов'язані з розвитком смарт-промисловості.

Ключові слова: смарт-промисловість, Індустрія 4.0, Консорціуму промислового Інтернету, смарт-підприємство, промисловий інтернет речей, кіберфізичні виробничі системи, інформаційно-комунікаційні технології, великі дані.

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РАЗВИТИЕ СМАРТ-ПРОМЫШЛЕННОСТИ КАК ЭФФЕКТИВНЫЙ ПУТЬ РЕАЛИЗАЦИИ ПОЛИТИКИ НЕОИНДУСТРИАЛИЗАЦИИ В МИРЕ

Раскрыты особенности промышленного смарт-предприятия (как гибкого киберфизического производства, которое обеспечивает точную настройку на потребителя и базируется на использовании больших данных), а также смарт-промышленности. Проанализированы этапы реиндустриализации ведущих стран мира на пути к построению смарт-промышленности. Определены новые перспективы, возможности и проблемы, связанные с развитием смарт-промышленности.

Ключевые слова: смарт-промышленность, Индустрия 4.0, Консорциум промышленного интернета, смарт-предприятие, промышленный интернет вещей, киберфизические производственные системы, информационно-коммуникационные технологии, большие данные.

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