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ANALYSIS OF CURRENT TRENDS IN THE REGIONAL SMART ECONOMY: CHALLENGES AND PROSPECTS FOR UKRAINE

Abstract. The formation of the economy based on knowledge-based innovative economy, new economy, at the present stage of social development is defining the international concept, according to which knowledge play a primary role, and their production is a source of economic growth and competitiveness. The economy is based on knowledge that provides a smart, sustainable and inclusive development. The purpose of the study. Showing that the implementation of the Strategy «Europe 2020», the main directions of the Fourth Industrial Revolution in the Ukraine will be able to provide smart, sustainable, inclusive development of the regions of Ukraine, will help to overcome the crisis and become a source for economic growth. Research methods. In the process of writing were used scientific methods, methods of analysis and synthesis, method of scientific abstraction. The results of the study. Macroeconomic instability has been transformed at the regional level, which led to the deepening of regions differentiation, particularly as it affected old industrial regions, including Donetsk and Luhansk. The crisis of public finances does not allow attracting of financial resources for economic development. As a result of hybrid war, the outflow of foreign investment amounted to 12.6 billion dollars USA. A significant part of the Donetsk and Luhansk regions is completely destroyed. Along with this, it's perfect conditions in order to abandon the old and build new. There are all conditions to implement actively the European strategy «Europe 2020» and the main directions of the Fourth Industrial Revolution to a new stage of economic development, and ensure smart, sustainable and inclusive development of the regions of Ukraine. Conclusions and discussion position. The future of Ukraine and its regions depends on the activity of the Strategy «Europe 2020» and the main directions of the Fourth Industrial Revolution. In Ukraine, in the regions, the main emphasis is on export-oriented industries: coal,

metallurgical, chemical, machine-building industry. Technically they are 3 and 4 technological structures, so they cannot become the breakthrough sectors of the Ukrainian economy, so the main emphasis should be on smart, sustainable and inclusive development.

Keywords: smart growth, sustainable development, inclusive growth, differentiation of regions, the Fourth Industrial Revolution.

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АНАЛІЗ СУЧАСНИХ ТЕНДЕНЦІЙ СМАРТ-ЕКОНОМІКИ РЕГІОНІВ: ВИКЛИКИ І ПЕРСПЕКТИВИ ДЛЯ УКРАЇНИ

Анотація. Формування економіки, заснованої на знаннях, інноваційної економіки, нової економіки, на сучасному етапі суспільного розвитку визначає міжнародну концепцію, згідно з якою знання відіграють першорядну роль, а їхнє виробництво є джерелом економічного зростання і конкурентоспроможності. Економіка базується на знаннях, які забезпечують розумний, стійкий та інклюзивний розвиток. Метою статті є аналіз концепції розумної економіки для визначення стратегічних заходів, спрямованих на сталий розвиток регіонів України. Макроекономічна нестабільність трансформувалася на регіональному рівні, що призвело до поглиблення диференціації регіонів, особливо оскільки це торкнулося старих промислових регіонів, включаючи Донецьк і Луганськ. Криза державних фінансів не дозволяє залучати фінансові ресурси для економічного розвитку. У результаті гібридної війни вплив іноземних інвестицій становить 12,6 мільярда доларів США. Значна частина Донецької та Луганської областей повністю зруйнована. Поряд з цим, це ідеальні умови для того, щоб відмовитися від старого і побудувати нове. Існують усі умови для активної реалізації європейської стратегії

«Європа 2020» та основних напрямів Четвертої промислової революції на новий етап економічного розвитку, а також для забезпечення розумного, стійкого та інклюзивного розвитку регіонів України. Майбутнє України та її регіонів залежить від діяльності стратегії «Європа 2020» та основних напрямів Четвертої промислової революції. В Україні, в регіонах, основний акцент робиться на експортноорієнтовані галузі: вугільна, металургійна, хімічна, машинобудівна промисловість. Технічно це 3-тя і 4-та технологічні структури, оскільки вони не можуть стати проривними секторами української економіки, тому основний акцент повинен бути зроблений на розумному, сталому та інклюзивному розвитку.

Ключові слова: розумне зростання, сталий розвиток, інклюзивне зростання, диференціація регіонів, Четверта промислова революція.

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Introduction. The development of the smart economy is taking place all over the world and in all areas of society due to innovative growth and process transformation resulting from the emergence of new technologies. However, the digital economy is developing unevenly in different countries and regions, creating both new opportunities and barriers that must be overcome to successfully conduct business on digital platforms. Data is becoming a new production factor in today's environment, enabling the creation of value for the consumer and building business activity on a different technological level. In this regard, the smart economy and its construction problems become one of the most important topics studied by various foreign and Ukrainian scientists.

It is important to note that in recent decades Ukraine has not only failed to develop traditional for Western countries information and communication technologies (ICT), but also has not created any conditions for the transition to the digital economy. The dynamics towards the digitalization of business and non-profit spheres of organizations is extremely low. At the same time, the digitalization of all spheres of the economy in developed countries has been taking place for the last thirty years. The need to identify the main challenges to the digital transformation of regional economies, as well as the definition of business models based on digital data, determines the high relevance of the study, especially in the current conditions of development of Ukrainian enterprises.

Study analysis and problem statement. A number of researchers focus on the use of information and telecommunications technologies used in various urban functional systems and sectors of the economy as a whole, and it is the use of ICT as a means of ensuring economic development and competitiveness, that stands out as a characteristic of the «smart economy» and allows to separate it from the digital economy.

Many variants use the concept of smart economy as an innovation economy based on Industry 4.0 and various networks. Skitsko V. I. argued that the smart economy involves the creation of innovation clusters and mutual cooperation between enterprises, research institutes, and citizens to develop, implement and promote innovation through these networks [1—4]. A smart economy is a network economy that develops new models of cooperation in production, distribution, and consumption [5; 6].

In other cases, the concept of the smart economy is used as sustainable development with definitions such as «green economy», «green industry», used to describe a modern efficient economy. UNEP defines the green economy as an economy that leads to improved human well-being and social justice while significantly reducing environmental risks and environmental problems [7]. The UN Environment Program shows that the green economy is becoming a new engine of growth, contributes to the creation of decent jobs, and is a vital factor in eliminating chronic poverty. The smart economy is a green economy; it encourages the reduction of carbon dioxide in industry and suggests investing in a «clean economy» [8].

There are many concepts of using smart environments in a variety of subject areas: smart transportation system projects, smart manufacturing, smart buildings (houses), smart cities, etc. Many researchers consider the smart economy, especially in the context of the smart city economy.

The International Telecommunication Union (ITU) Task Force on Smart Sustainable Cities has produced a technical report to develop a specific definition of «smart sustainable cities» that can be used around the world. The main topics of the SSC include: society, economy, environment, and management. Abdullayev noted that the concept of «smart city» is a new socio-technological paradigm and advanced economic model for sustainable growth in the XXI century [3].

In general, there are general characteristics of a sound economy, which together allow us to identify its specifics [5]:

1. Innovation and the knowledge economy: innovation, productivity, and cost reduction in all sectors of the economy;
2. Economics of Learning: Learning is the most important process in all areas of the economy;
3. Digital economy: extensive use of information and telecommunication technologies in the economy;
4. Competitive economy: the ability to compete globally and be open. While using knowledge and innovation, there is a competition based on increasing profits, productivity, quality, resource and cost efficiency (especially overhead), and reducing waste;
5. Green economy: implementation of the principles of sustainable development, aiming at a «clean» economy free of pollution, and efficient consumption of energy resources;
6. Networked economy: developing networks of competencies between universities, business, and government;
7. Socially Responsible Economy: Enterprises and organizations are characterized by economic, moral, legal, and philanthropic responsibility. The research revealed different definitions of «smart economy» in the scientific literature and in different strategic documents. The above characteristics of the smart economy can also serve as criteria for assessing the smart economy of the regions of Ukraine.

Identification of strategic measures can provide more environmentally friendly and economically sound solutions to some of the problems of developing economies such as Ukraine. The purpose of this article is to analyze the concept of smart economics to identify strategic measures aimed at the sustainable development of Ukrainian regions.

Study results. Peculiarities of the prospects of a reasonable economy of Ukraine are that this country has a low technological structure of the economy (metallurgy, chemical industry, agriculture, petrochemistry, obsolete energy, heavy engineering), has lost control of the Crimea (with the gas fields of the Black Sea shelf and the tourist segment) a significant part of the industries of Donbas. The level of sustainable development reflected the value of the specific share of the technological structure of the Ukrainian economy. Ukraine's economy is non-competitive because of high energy and resource costs. There are significant losses in the use of resources caused by outdated technology and inefficient pricing (especially for companies that use them in the production process and end-users). Ukraine is one of the biggest air polluters in Europe. Thus, in 1990, the total volume of greenhouse gas emissions in Ukraine amounted to 16.7% of EU indicators (the share of Ukraine's GDP was 1.1% of EU GDP). Their share decreased to 8.6% in 2019 (Ukraine's share of GDP was 0.6% of EU GDP), but this is very important because of the difference in GDP. An important driver of a smart economy is comprehensive policies and measures to reduce energy intensity. Clean energy includes energy efficiency and clean energy options, such as high-efficiency combined heat and power, as well as renewable energy.

Compared to developed countries, the energy intensity of Ukraine's GDP is very high, which determines the low competitiveness of the economy. The efficiency of the use of natural resources in Ukraine is very low. The issue of energy-saving in Ukraine is extremely urgent, as the level of energy intensity of GDP in Ukraine is 2.5—3 times higher than in most European and developed countries of the world due to the predominance of primary processing industries, technical and technological backwardness of fixed assets of the most energy-intensive industries. The level of energy intensity of GDP: Japan 0.11; the United Kingdom 0.14; Germany and France 0.18, the United States 0.21 kilograms of oil equivalent per GDP in purchasing power parity dollars.

The level of energy intensity of GDP in Ukraine is 0.31 kg of oil equivalent per GDP in US dollars at purchasing power parity.

In 2014, Ukraine signed an association agreement with the European Union, so it must comply with the directives and norms adopted in the European Union, the best examples of development in general and regions in particular.

The «Europe 2020» strategy has 7 areas:

1. Innovation Union to improve conditions and opportunities for funding research and innovation to ensure that innovative ideas are used in the production of goods and services, which will contribute to economic growth, creating new jobs;

2. Youth Movement to Improve the Effectiveness of Educational Systems and Promote Youth Involvement in the Labor Market;

3. IT development plan for Europe to accelerate the widespread development of high-speed Internet and enable private individuals and businesses to participate in a common commercial environment;

4. Sustainable use of resources to ensure resource-independent economic growth, promoting the transition to a low-carbon economy, expanding the use of renewable energy, modernizing the transportation sector, and ensuring the sustainable use of renewable energy sources;

5. Industrial policies aimed at globalization to improve the business environment, particularly for small and medium-sized businesses, to support the development of a strong and stable industrial base for overall globalization;

6. Plan to develop new abilities and increase the number of jobs to modernize labor markets, provide people with opportunities to gain new knowledge and skills to expand employment opportunities; improve the balance between supply and demand in labor markets, including labor mobility;

7. European anti-poverty policy, so that social and territorial interaction is widespread throughout the territory, and achievements in economic development and employment contribute to the reduction of poverty throughout the EU-11.

These directions echo the main directions of the Fourth Industrial Revolution. At the World Economic Forum in Davos in 2016, the Fourth Industrial Revolution was announced. The German government declared that the Germans are building Industry 4.0, the U.S. has been saying for several years that the age of the World Wide Web is coming. The Chinese claim: «Where there is a crisis, there is the opportunity» [4].

Indeed, many Ukrainian scientists believe that under current conditions Ukraine has a unique opportunity to overcome the crisis with dignity while implementing the main directions of the strategy «Europe 2020» and the main directions of the Fourth Industrial Revolution. The Fourth Industrial Revolution is stipulated:

1. Development of customer experience management technologies.

2. Transition from mass production of the same products to «mass customization» — this is mass production according to individual orders.

3. Globalization manifests itself in «globalization», i.e., «Think globally, act locally».

4. Development of Internet of Things (IT) technologies — the Internet of Things, even the Internet of Everything.

5. Opportunities for remote control of everything, including production.

6. 3D printing.

7. Manufacturing is coming home, that is, the development of automation and robotics brings the benefits of cheap labor.

8. Intelligent objects. Smart devices. Smart sensors.

9. Compliance with global standards is becoming a necessity and necessary even for local markets.

10. Sustainable development and stable growth of everything: population, economy, science, technology, on the one hand, and consistently growing environmental problems, on the other.

Every revolution, including the industrial revolution, opens up new possibilities. Social revolutions create certain means of social mobility, while industrial revolutions bring genuine innovators to the forefront and open up new opportunities. Accordingly, Ukrainian engineers, IT specialists, and entrepreneurs have new opportunities to develop new, advanced, progressive things.

The Ukrainian and regional economies are in a structural crisis. This is caused by a number of reasons: the hybrid war in the east of the country, the territorial loss of Ukraine, the protracted political crisis, the struggle of oligarchic clans for the redistribution of land, enterprises, raw material resources, the market for products.

As a consequence, the fall in GDP in 2020 was 7.6%, in 2019 — 12.6%; the fall in industrial production in 2019 was 24.6%, in 2020 — 30.2%; inflation for the period 2019—2021 was 350%, the growth of unemployment was 40.2%, the external debt of Ukraine rose to 1 trillion 500 billion UAH. 5 million people left Ukraine; 30 thousand people were wounded during hostilities; 13 thousand people were killed; there are 300 000 orphans in Ukraine. The rise in food prices was 300%, for basic necessities — 250%, for medicines — 500%, with a 26% increase in income (20% in 2019 and 6% in 2020), gas prices increased 7 times, electricity — 5 times, utilities — 5 times. Consequently, the differentiation of the quality of life of the population has increased sharply. The middle class has been destroyed [9]. These indicators characterize the structural economic crisis and at the same time are a pointer for the formation of policies aimed at reducing the effects of the crisis.

Ukraine suffers huge losses in the Donetsk and Luhansk regions. Ukraine's budget in 2019 received 23 billion hryvnias less (about 1 billion USD), in 2020 — 28 billion hryvnias less (1.1 billion USD). Ukraine lost 4 thousand enterprises in Crimea, which amounts to 1.18 trillion UAH. The reduction of industrial production facilities in the Donetsk region in 2018 was 31.5%, in the Luhansk region — 42%; respectively in 2020 in the Donetsk region — 38.4%, in the Luhansk region — 47.5%. More than 10 thousand objects were damaged and destroyed in the Donetsk region. More than 3 billion UAH will be required to restore the Luhansk region [9].

Traditional production links «coal-coke-metal» and «coal-energy» have been disrupted in the basic industries of the Donetsk region. Production of metallurgical products is 38.9% of the 2019 level, coke production decreased by 31.6%. Exports of metal products decreased by 12.6 billion USD [9].

Losses of domestic metallurgical enterprises are estimated at 40 billion UAH, where 25 billion UAH — are losses from non-production goods. Losses from the destruction of fixed assets amount to 15 billion UAH. Coal production has fallen by 35%. Of the 150 coal mines, 115 are located in the non-government-controlled territory of Ukraine. The chemical industry reduced production by 47.5%. The agro-industrial complex received more than 3% less gross production of agricultural products (7.5 billion UAH). In Ukraine, 1,514 railway infrastructure facilities were damaged, and 1,561 km of roads were destroyed. Donetsk and Luhansk airports were completely destroyed.

Macroeconomic instability and the economic and political crisis led to an outflow of investment and capital out of Ukraine. 112 billion US dollars were withdrawn from Ukraine during the period 2018—2021. All this affects the state of the national economy and regional development. The economic crisis has exacerbated the differentiation of regions. Kyiv is successfully developing, but the city authorities have an external debt of 2 billion U.S. dollars, the city cannot pay them back and more than once found itself on the verge of default [9].

The policy of the National Bank is imperfect. Under conditions of deep economic crisis, the National Bank pursues a policy of flexible exchange rate, systematic refinancing of commercial banks, 82 banks were liquidated. The population has lost about 200 billion hryvnias, 174 billion hryvnias of savings are taken by the population from the banks. This policy is insufficiently thought-out, causes discontent among the population, and damages the entire financial system of Ukraine.

Ukraine has announced reforms of local self-governance and territorial organization of power. Decentralization is successful for developed regions, which already have economic and

industrial potential; for other regions, decentralization has not yet become a basis for development, and without state financial support the socio-economic situation in these regions will worsen.

Experts estimate that \$15 billion is needed to revive Donbas. Donbas is an old industrial region where coal and iron ore have always been the main production. It is a region of raw materials. Coal mines are mostly not modernized, the enterprises of primary metallurgy, with the exception of Illich Steel and Azovstal, by their technological equipment, are in the 3rd and 4th technological mode, their revival and modernization require more than \$ 20 billion. The situation is not easy, especially given the lack of funds in the state budget and the decline in foreign direct investment inflows.

We see further development of the regions of Ukraine in the implementation of the main directions of the strategy «Europe 2020» and the main directions of the Fourth Industrial Revolution.

Speaking about the fourth industrial revolution, Jennifer Blank, a well-known economist, and Davos attendee said: «If you think of the 3rd industrial revolution, it was actually computerization — it was the digital age that started around the middle of the 20th century. And we see that the 4th Industrial Revolution is really based on that with all these fascinating technologies, whether it's biotechnology, artificial intelligence, 3D printing—all these different, fascinating things «coming together».

Nariman Behravit, a leading specialist at HIS Consulting, believes that the poor response of Chinese officials to financial problems may be a short-term risk for the global economy. The specialist believes that this will not lead us into a recession, but investors are very nervous, and this affects financial markets around the world.

The World Economic Forum described the Fourth Industrial Revolution as a tsunami of technological innovation that will transform our economy, but what impact it will have on the labor market, where jobs will come from for all people, is still a question.

Ukraine has every chance to be at the forefront of the Fourth Industrial Revolution. In 1951, Ukraine created and put into operation the world's third computer (after the USA and Great Britain), called SEAM (small electronic accounting machine).

As of early 2019, the number of computers in the world has reached 4 billion and continues to grow. The United States, Japan, Germany, the United Kingdom, Canada, France, Spain, China, and Australia have the most computers [10].

The history of the World Wide Web begins in 1968 when the Arpanet military computer network began to develop in the United States. The name was created using the acronym ARPA (Advanced Research Projects Agency) and «net». The following year, the first four IMPS began operating — at the Universities of Los Angeles, Santa Barbara, Salt Lake City, and Stanford. The first Internet users appeared on the territory of Ukraine back in the Soviet era. At the same time, starts some support of the Ukrainian part of the domain space of Internet domain UA. December 1, 1992, domain UA was officially transferred to Ukraine. From this point of view, it is customary to consider the beginning of the history of the Ukrainian segment of the Internet (the fourth scientific revolution, 2015).

Leading innovative corporations are doing all they can to accelerate the rapid pace of the global industry. Apple, Google, Tesla, and Microsoft lead the list of the most innovative companies. Innovation is completely changing not only the way people live but also their minds. Almost all production processes are automated; even cars are able to transport us without drivers. Ukraine, after the U.S. and Cyprus, ranks third in the world in terms of IT training.

Biotechnology, nanotechnology, and genetic engineering can become leading industries in regions of Ukraine.

Smart city projects are being implemented in Kyiv and Vinnitsa. They are aimed at urban development and are successfully implemented in megacities around the world. In April 2015 Kyiv joined the Smart City movement. The main goal of this initiative is to unite efforts and attract modern technologies to make Kyiv developed and comfortable for life, as well as to improve the efficiency of city management by improving information and technical support.

The Kyiv Smart City project implements several projects. First, the electronic city budget was launched, and now citizens and public authorities of the city can monitor the main indicators of the distribution of funds of the city and state budgets. Also implemented a system of fare payments by bank cards and developed an energy management system for Desnyanskyi district. Smart city projects are implemented in many major cities around the world: London, New York, Paris, Helsinki, Berlin, Tokyo, Singapore, and Vienna. The involvement of innovation allows us to create conditions for quick and high-quality solutions to the main problems of megacities. For example, in Boston, after the terrorist attack, a preventive security control system was launched. It allows scanning everything — even social networks — and identifying sources of security for citizens.

In 2015, Vinnitsa was included in the UN project to develop smart cities. The pilot project to develop a network of «smart» cities includes Turav in the Republic of Belarus, Vinnitsa in Ukraine, Goris in Armenia, and Dushanbe in Tajikistan. The goal of the project is to prepare megacities and human settlements to meet a range of challenges posed by urbanization [9].

In many regions of Ukraine, «smart home» projects are successfully implemented, which have high-quality support systems and operating multi-rooms, by which all electrical appliances of the building are functionally connected and can be centrally controlled from the display panel. The appliances can be connected to a computer network, allowing them to be controlled by a PC and have remote network access to them via the Internet. By integrating information technology in the residence, all systems and equipment coordinate internal functions by comparing programs and external indicators.

The following terms are used to define high-tech housing features: smart building, smart home, digital home:

- reliable and easy-to-use security and video control system;
- automatic centralized correction of lighting depending on the time of the day and people's movement around the house (especially important for those raising children or caring for an elderly relative);
- household chores that fall on a person's shoulders in a smart house correspond to all the systems of the house and are performed most easily and efficiently with the use of modern equipment. It can be, for example, watering the garden and sheltering it from the sun in accordance with the weather conditions; opening the doors to walk pets so that they can go outside on their own in the morning;
- control of gas and water;
- focus on energy conservation;
- home automation at home to improve living conditions and simplify household tasks for people with disabilities;
- all functions are performed through a single display panel;
- full-featured home theater;
- necessary conditions for play;
- creative technology can be effectively incorporated into the interior of the home, office;
- availability of the necessary facilities and functioning of the rooms corresponds to the child's upbringing: its development, safety, and entertainment.

Smart homes, like most modern technological advances, first appeared on the pages of science fiction publications; the idea materialized only in the XX century after the widespread use of electricity in buildings and the development of information technology. Given the macroeconomic state of regional development, it is better to abandon the old and build new. The transition to the new Kondratiev wave indicates the gradual exhaustion of the potential of the modern version of the new economy, the engine of future economic development will belong to other technologies and industries. Intensification of efforts to develop new technologies, creating the competitiveness of products that are needed in future markets, will be the basis for the successful integration of the Ukrainian economy into the world economy, obtaining the status of a powerful player in the new economy, after which the role of the regions will significantly increase.

The regions will become the basis and initiators for the development and implementation of new technologies, the development of new commodity industries.

Conclusions. The modern stage of development of the world economy is characterized by accelerated scientific, technological and social progress, the formation of a new economy, smart, sustainable and inclusive development, where knowledge reproduction has a significant impact on the dynamics of economic growth. Ukraine's regions have a great imbalance in development. This is especially true of the old industrial regions, including Donetsk and Luhansk oblasts, much of whose territory is in the zone of military operations.

All the old is located in 3 and 4 technological buildings. Thus, it will be more effective to modernize the old, successfully take part in the fourth industrial revolution and begin to implement the strategy «Europe 2020». The formation of a new knowledge-based economy in Ukraine is associated with qualitative changes in the structure and level of development of the national economic complex, ensuring regional development. A knowledge-based society needs to develop a new ideology that permeates all of society and is focused on innovation. The leading role in this process is given to the interaction of the state, society, business, and the scientific community. In the long-term perspective, it is the scientific-innovative sector of the economy, and not the fuel and raw materials sector that can provide Ukraine's breakthrough into the innovative economy. For this, we need innovative managerial decisions. The human intellect becomes the main value of the new economy, and the quality of labor will characterize the ability of an individual to generate new knowledge, ideas, and discoveries.

Smart cities and smart homes will lead to significant progress and create a socially just way of applying human labor and creativity.

The basis for modernization would be smart, sustainable, inclusive development. In times of crisis, the state should not scatter financial resources, but determine the priorities and specialization of each region in planning on a long-term horizon, which will take into account the provisions of the strategy «Europe 2020», the main directions of the Fourth Industrial Revolution; innovative development of the social system; creating the integrity of education and training, all this, finally, should ensure a reasonable, sustainable, inclusive development of regions and the country as a whole.

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