

How to cite: Oneshko, S., Pashchuk, L. (2021). Industry 4.0 and creative economy (globalization challenges of the time). *Futurity Economics & Law*, 1(4). <https://doi.org/10.57125/FEL.2021.12.25.01>

Industry 4.0 and creative economy (globalization challenges of the time)

Svitlana Oneshko

PhD of Economics, Associate Professor, Professor Department of Economics and Finance, Institute of Marine Business Odessa National Maritime University, Mechnikova str, 34 Odessa 65029, osvfox1@gmail.com, <https://orcid.org/0000-0003-2313-3984>

Lidiia Pashchuk

Doctor of economic sciences Docent of Department of International Economics and Marketing, Faculty of Economics, Taras Shevchenko National University of Kyiv, 60 Volodymyrska Street, City of Kyiv, Ukraine, 01033, Lvp.undp@gmail.com, ORCID: 0000-0002-9664-9351

Received: September 20, 2021 | **Accepted:** November 28, 2021 | **Published:** December 25, 2021

Abstract: Scientific intelligence aims to position Industry 4.0 and the creative economy as components of the modern economy in the local and global dimensions. The new economic reality is causing transformations in all areas of life. At the same time, the economy also needs innovative transformations and a new development paradigm. Information and technology are the two key elements that condition the revolution 4.0 in the modern scientific picture of the world. The task of the article is to differentiate the concepts: The 4th industrial revolution, Industry 4.0, creative economy, and determination of the demanded and effective economic model in the modern socio-cultural space. Research methodology is based on general scientific methods (analysis, systematization, classification, structurization), methodology of scientific and economic discourse (method of absolute and comparative advantages, modeling, optimization, determination of equilibrium), and scientific and philosophical methodological synergetic principle. The results of the study are expressed in the theoretical-methodological and organizational-logistic guidelines for the innovative format of a modern economy based on the principles of informatization and technologization and corresponding to the ideas of the global paradigm of the 4th industrial revolution. So, the modern economy is guided by the principles of dynamism, mobility, pragmatism, and creativity. These concepts form the innovative potential of the modern economic paradigm and the basis for the implementation of the processes of digitalization, informatization, and technologization.

Keywords: industrial revolution 4.0, modern economic paradigm, creativity in the economy, digitalization, ICT cluster in the economy, globalization of the economy.

Introduction

If the term “Industrial Revolution 4” defines radical transformations in all areas of social life, in which the principles of digitalization and technologization are implemented, then the concept of “Industry 4.0” provides for the organization of innovative ICT transformations in the economic cluster. The creative economy in the modern sociocultural paradigm is responsible for the human dimension. The ability of humans to influence the level of economic development by innovative rather than exclusively regulatory mechanisms is important for this sphere of activity.

Research Problem

The concept of “Industry 4.0” is global in nature and involves the involvement of information technology and digital potential at the civilizational level in all areas of social activity. It is impossible to isolate innovative industrial principles locally in the economy without affecting political interests, social constructions, or cultural characteristics. Consequently, there is an obvious problem for scientific and economic discourse - through what mechanisms to achieve synergy between the economy and other spheres, given the rapid introduction of ICT & digital elements? The need for a human-dimensional solution to this problem is obvious. If special economic characteristics of efficiency grow due to innovative technologies, then the characteristics of economic efficiency in the sociocultural space grow due to the level of human torture in this process. Under such conditions, the creative economy is at the forefront of the human dimension of Industry 4.0. This is how the correlation between the principles of Industry 4.0 and the creative economy in the unified economic paradigm of the twentieth century is realized.

Research Focus

Informatization, technologization, and digitalization are processes that determine the model and strategy of economic development on a local and global scale. For a long time, ICT elements have played an important role in economic processes and the production sector. However, we can assert that innovative transformations in the modern economy have led to the creation of a qualitatively new format of economic realities. Industry 4.0 did not appear as a mechanism in the economy but formed its own economic model of development. At the same time, the creative economy provides the human potential for the 4.0-format economy. The focus of study focuses on the uniqueness of the synergistic effect manifested in the combination of human creative potential and the capabilities of the ICT elements of the economy.

Research Aim and Research Questions

The research aims to determine the implementation of the principles of Industry 4.0 and the creative economy in short-term economic programs and long-term global strategies. The objectives of the article are to try to determine the role and status of Industry 4.0 and the creative economy in the socio-economic paradigm of today and the practically oriented real sector of the economy.

The key question of scientific exploration is to identify the principles that drive the modern economy:

- dynamism;
- mobility;
- pragmatism;
- creativity.

Research Methodology

General Background

The methodology of research of Industry 4.0 and creative economy assumes the use of general scientific methods realized in the economic environment. The methods of analysis, systematization, classification, induction, and deduction are fundamental to the study of the laws and principles of the economy. The creative and digital field is inextricably linked to modeling and forecasting. The method of economic experiment and their interpretations are important for identifying the positive and negative aspects of the introduction of innovative elements in the economy.

Important directly for our study is the cluster of scientific and economic discourse. The method of absolute and comparative advantages acts as the basis of the basic economic characteristics of innovative models in this area. The comparative analysis indicates the advantages of Industry 4.0 and creative economy in relation to traditional and established formats of economic activity. Optimization is an important methodological principle due to which acceptable indicators (minimum, maximum, or average) of the realization of separate elements of the new economic model are defined. Determining the equilibrium is relevant for achieving the synergistic effect associated with combining traditional and innovative ideas in the modern local and global economy.

Among the promising approaches in the scientific and economic discourse concerning the development of Industry 4.0, we note the transdisciplinary method of solving uncertainties (Pólvora et al., 2020). The innovative method of scientific and technological art is relevant to the creative economy. Interdisciplinary creativity helps to overcome bureaucratic institutions (Bo et al., 2020).

Sample / Participants / Group

Participants in scientific exploration are the national models of individual countries whose economies are focused on Industry 4.0 and the principles of the creative economy. The coordinated economic formations of different communities form a global economic model focused on innovative development and progress. Economy 4.0 is just a set of elements and mechanisms, thanks to which informatization, technologization, and digitalization have unlimited possibilities for the implementation of innovative economic models. When the focus is on socio-economic or cultural-economic spaces, the ideas of a qualitatively new worldview-economic paradigm should be outlined here, based on which the ICT cluster appears.

The modern economy defines self-organization processes as one of the key elements, which significantly expands the circle of people involved in the functioning of the economic model. Now the subjects or objects of the economy are not only people involved in production or consumption. We consider the format of economic development, in which a cluster of stakeholders is formed - all those who form or experience the influence of the economy on the social structure. Under such conditions, the creative economy or ICT-economy receives favorable conditions for approval in the sociocultural space.

Agolla (2018) characterizes Industry 4.0 by the following elements: cyber-physical systems (CPS, a combination of the real and virtual economy), the Internet of Things (IoT, intelligent systems that interact through IP communication), the Internet of Services (IoS, a new service delivery format based on consumer and producer behavior control), the Internet of Data (IoD, sharing and managing big economic data). At the same time, Industry 4.0 and creative economy reveal the personal development of the economic segment stakeholder (Črešnar & Jevšenak 2019). The humanity of the economy is determined by the influence of economic elements on human life and well-being. Industry 4.0 has a determining influence on human capital and regulates consumer behavior (Sima et al., 2020).

Research Results

The role of Industry 4.0 and the creative economy in the paradigm of global economic development is being reoriented from promising to fundamental status. This was facilitated by the high performance of the economy's innovative ICT cluster. First of all, the new economy 4.0 has demonstrated excellent results in the financial sector, using the principles of digitalization and technologization. In addition, Industry 4.0 responded to the global challenge of the economic crisis of the early 21st century. The information and creative cluster was also involved in the transformation of the financial system, transforming it from a static to a dynamic structure.

Innovative principles of economic development became relevant due to the principles that gave this sphere flexibility (see Table 1).

Table 1

Soft principles of the innovative economy 4.0.

Dynamism	The global economic and financial crises of the early XXI century revealed the inadequacy of static economic models to respond quickly to threats and challenges, which led to the need for new dynamic formats of the economic paradigm. Only new information-technological solutions of Industry 4.0 could provide dynamism.
Pragmatism	Orientation of the modern worldview to the result demands from the sphere of public activity efficiency. The ICT cluster has proven highly effective for both the financial and production sectors of the economy, introducing elements of digitalization and technologization.
Mobility	The economic cluster in today's world is undergoing rapid change. Transformations are taking place horizontally and vertically at the state, local-regional or international level. To meet the organizational needs of the modern economy, it is necessary to attract innovative production and logistics technologies with the proper level of communication between the stakeholders of the economic cluster.
Creativity	Economic life is a component of the general socio-cultural space, so the trends inherent in the cultural-historical epoch, in general, are reflected in the economy in particular. Creativity is a common phenomenon in the modern information society. Under such conditions, innovative creative elements are increasingly realized in the economy.

Source: authors' own development

It should be noted that for all economic innovations there comes a moment of truth - it is the ability to demonstrate effective results in the real sector of the economy. In other cases, even the most advance

models are worthless if they cannot be implemented. Industry 4.0 technologies are being successfully implemented at all economic levels. In particular, local SME production systems have already assimilated the benefits of the ICT cluster in the real economy (Bellandi et al., 2019). In addition to the benefits of the new format of economic activity, let us note the difficulties faced by small and medium-sized enterprises operating in the new mode. Industry 4.0 is essentially a global dimension, so the implementation of its principles at the lower levels requires skillful organizational and logistical prowess, which is possible with the appropriate ICT and digital competencies of employees.

It should be understood that Industry 4.0 is implemented differently in different countries based on the economic potential and economic culture of a particular community. Yang&Gu (2021) interpreted Industry 4.0 in the following ways: “bottom-up” as in Portugal, “top-down” as in Italy, and evolutionary as in the United States. The digital society, which is a favorable environment for the realization of the principles of Industry 4.0, forms new ideas for all the stakeholders of the economic space. This is especially true for those directly involved in the economic sector. Industry 4.0 significantly increases job creation rates (Ruhiyati et al., 2019).

The creative industry is experiencing a clear rise in the modern economy (Centárová, 2020). Creativity as a fundamental manifestation of human essence has always been an important element of worldview/civilizational paradigms. However, in certain periods the creative element has been to a certain extent leveled or suppressed by other components of human potential.

The modern orientation towards freedom and democratic priorities have formed the worldview basis for the realization of human creative potential. At the same time, in the global dimension, we also state the creation of a favorable socio-economic environment for the realization of creative elements. “All people are creators of sorts. The tools with which we work are constantly using our human abilities and have evolved throughout history to take advantage of any innovation or a new source of energy. The symbiosis of man and technology has always been the basis for leaps and bounds in human flourishing. As we are now in the Fourth Industrial Revolution or Industry 4.0, it is important to focus on the challenges and opportunities of modern working life. Here we see the worker, the operator, benefiting from the technology of cyber-physical systems, communications, and global information networks while maintaining human strengths and weaknesses” (Romero et al., 2020).

The organizational component of innovation transformation is the key to its success. Examples of individual countries can be used to trace the mechanisms of creating the operating systems and infrastructure elements of Industry 4.0 (Sung, 2018). Industry 4.0 is defining in different areas of economic science. In particular, “the concept of technology in economic geography is concerned with how knowledge broadly adds value to the produced or service product in a company’s value chain, and how the availability and accessibility of knowledge can increase the competitive advantage of an economic entity and thus affect the spatial pattern of production and consumption” (Henning & Alvstam, 2020). Economic geography permeates the principles of Industry 4.0 both horizontally and vertically: from routine production activities to international economic relations.

Discussion

The main discussion problem of the modern economic system is to settle the balance between stability (traditionalism) and instability (innovation). The correlation of the principles of national and transnational strategies of economic development in a single global paradigm is the key task of the economic community. The dynamics of the development of industry and economic activity based on technology indicates that the 4th industrial revolution will be replaced by the next level (5.0) as quickly

as formed in the modern economic system. Critical thinking, communicativeness, synergy, and creativity are at the core of the transformation of the economic system (Ungureanu, 2020).

The synergy of scientific-technological and human-mechanical elements forms the dynamism of the economy in the sociocultural environment, due to which the transformation does not occur paradigmatically (1.0, 2.0, 3.0, 4.0... etc.), but in the mode of online updating (on the example of system or software updating of technological) elements.) Under such conditions, we can further interpret paradigm shifts in economics in a radically different way.

Modern scientific and economic discourse is permeated by the debate about the lack of correlation between Industry 4.0 (i4.0) and the concept of Future Labor (FoW) in the technological-digital space (Rainnie & Dean, 2020). The mismatch is expressed in the fact that gaps are appearing in the economic space, especially in the real economy sector. In particular, informatization and digitalization continue the complete decline of certain professions that began with the first industrial revolutions. Consequently, there is the threat of an excessive fascination with the digital virtual world. While in the financial sector this prospect has a standard level of threat, in the production cluster of the economy it could have disastrous consequences.

The implementation of the principles of Industry 4.0 at the national level faces certain difficulties. training personnel with appropriate professional competencies; barriers related to economic activity in the digital and technological sector of the state (Ślusarczyk et al., 2020).

The Internet of Things (IoT) stimulates the management of the circular economy, a long-standing goal of the global financial and economic community (Awan et al., 2021). Historically, this economic excellence has lacked mechanisms for implementation in a global dimension. Examples of closed-loop economics have already occurred in history, but they were local and relatively short-lived. Industry 4.0 is a stage, which, if it does not become decisive in the creation of a global economic paradigm, will significantly approach the realization of this mega-project.

Creative industries are divided into cultural and intellectual ones. As evidenced by the statistics of economic activity in the European Union, the creative industries are in a state of active development. At the same time, the number of workers involved in the creative cluster of the economy is increasing (Dronyuk et al., 2019). The general trend of leading an active life with rapid innovation is reflected in the economy. Technologization and digitization are driving the integration of a practically commonplace human lifestyle into the economic model of development.

Industry 4.0 provides elasticity and mobility in the economic system. This leadership is achieved by combining humans and automation in the production process (Taylor et al., 2020). Automation involves not only technological improvement but also adaptation to the digital format. Flexible manufacturing involves the use of ICT elements in both large-scale production facilities and in a cluster of small businesses.

Ghobakhloo (2020) emphasizes the exponential progress of Industry 4.0. When considering the economic system, it should be understood that the digital revolution is rapid. At the same time, there is a need to actualize the function of economic sustainability, which is expressed in social, cultural, environmental, energy. Industry 4.0 is inherently contrary to sustainable evolutionary development. However, the economy cannot be in a state of constant cardinal changes, because it can destroy its foundations. Consequently, the information and technology component should be within a certain economic framework, which will ensure the stability of the economic system.

Industry 4.0 and the creative economy are shaping a new corporate system design format (Cochran & Rauch, 2020). Entrepreneurship design is based on the principles of economic, environmental, and social permanence. Under the traditional model of the economy, design has faced quite a lot of difficulty related to the inability to process economic indicators, which are constantly growing quantitatively and qualitatively. With digital technology, processing big data is not much of a challenge, so innovative transformations are the basis of modern economic strategies. Consequently, the innovation element becomes the basis for the constancy of economic processes.

Conclusions and Implications

Hence, Industry 4.0 and the creative economy are two interrelated components of the economic paradigm of the twentieth century. These elements concentrate on the information, digital and technological potential of the industrial and financial sector of the economy and human creative abilities realized in innovative economic models. Let us note the principles that form innovative economic strategies:

- dynamism as a prompt response to permanent threats to the economic system thanks to the ICT element;
- mobility as new organizational opportunities of digital and technological nature in the economic sector for all stakeholders;
- pragmatism as a focus on the effectiveness of the processes of digitalization and technologization in the economic segment;
- creativity as a human-dimensional characteristic of human creative initiatives that are innovative in the economic paradigm.

The results of this study point to the uniqueness of the synergy effect in the modern economic paradigm, which is characterized by the combination of human potential and the capabilities of the ICT elements of the economy. Economy 4.0 is characterized by technologization and digitalization correlated with information and communication elements. The economic strategies of the modern world do not simply take into account digital technological models but are shaped by their principles. Industry 4.0 and the creative economy are innovations that are gradually becoming fundamental components of the new economic paradigm.

References

- Agolla, J. E. (2018). Human Capital in the Smart Manufacturing and Industry 4.0 Revolution. In A. Petrillo, R. Cioffi, & F. De Felice (Eds). *Digital Transformation in Smart Manufacturing*, IntechOpen. <https://doi.org/10.5772/intechopen.73575>
- Awan, U., Sroufe, R., Shahbaz, M. (2021). Industry 4.0 and the circular economy: A literature review and recommendations for future research. *Business Strategy End The Environment*, 30, 2038–2060. <https://doi.org/10.1002/bse.2731>
- Bellandi, M., De Propris, L., & Santini, E. (2019). Industry 4.0+ challenges to local productive systems and place-based integrated industrial policies. In: Bianchi, P., Durán, C. R., Labory, S. (Eds). *Transforming Industrial Policy for the Digital Age*, Cheltenham, Edward Elgar Publishing, 201–218. <https://doi.org/10.4337/9781788976152.00016>

- Bo, Y., Baoyang, C., & Zhi-ou, W. (2020). Methodology on Human-robotics Stage Performance and Creation. *IFAC-PapersOnLine*, 53(5), 110-115. <https://doi.org/10.1016/j.ifacol.2021.04.089>
- Centárová, J. (2020). Creative economy as a tool of competitiveness, *SHS Web of Conferences* 83, 01007. <https://doi.org/10.1051/shsconf/20208301007>
- Cochran, D. S., & Rauch, E. (2020). Sustainable Enterprise Design 4.0: Addressing Industry 4.0 Technologies from the Perspective of Sustainability. *Procedia Manufacturing*, 51, 37-1244. <https://doi.org/10.1016/j.promfg.2020.10.173>
- Črešnar, R., & Jevšenak, S. (2019). The millennials' effect: How can their personal values shape the future business environment of industry 4.0? *Our Economy*, 65(1), 57-65. <https://doi.org/10.2478/ngoe-2019-0005>
- Dronyuk, I., Moiseienko, I., & Greguš, J. (2019). Analysis of Creative Industries Activities in European Union Countries. *Procedia Computer Science*, 160, 479-484. <https://doi.org/10.1016/j.procs.2019.11.061>
- Ghobakhloo, M. (2020). Industry 4.0, digitization, and opportunities for sustainability. *Journal of Cleaner Production*, 252, 119869. <https://doi.org/10.1016/j.jclepro.2019.119869>
- Henning, M., & Alvstam, C. G. (2020). Technology Industries. In: Kobayashi, A. (Ed). *International Encyclopedia of Human Geography*, Elsevier, 199-205. <https://doi.org/10.1016/B978-0-08-102295-5.10138-6>
- Pólvora, A., Nascimento, S., Lourenço, J. S., & Scapolo, F. (2020). Blockchain for industrial transformations: A forward-looking approach with multi-stakeholder engagement for policy advice. *Technological Forecasting and Social Change*, 157, 120091. <https://doi.org/10.1016/j.techfore.2020.120091>
- Rainnie, A., & Dean, M. (2020). Industry 4.0 and the future of quality work in the global digital economy. *Labour and Industry*, 30(1), 16-33. DOI: 10.1080/10301763.2019.1697598
- Romero, D., Stahre, J., & Taisch, M. (2020). The Operator 4.0: Towards socially sustainable factories of the future. *Computers & Industrial Engineering*, 139, 106128. <https://doi.org/10.1016/j.cie.2019.106128>
- Ruhiyati, I. A. T., Mohd, S. S., & Ruzimi, M. (2019). Digital Society and Economy for People with Disabilities in Industry 4.0: Malaysia Perspectives. *Creative Technologies*, 6(20), e5. DOI: 10.4108/eai.30-7-2019.162949
- Sima, V., Gheorghe, I. G., Subić, J., & Nancu, D. (2020). Influences of the Industry 4.0 Revolution on the Human Capital Development and Consumer Behavior: A Systematic Review. *Sustainability*, 12, 4035. doi:10.3390/su12104035
- Ślusarczyk, B., Tvaronavičienė, M., Haque, A., & Oláh, J. (2020). Predictors of Industry 4.0 technologies affecting logistic enterprises' performance: international perspective from economic lens. *Technological and Economic Development of Economy*, 26(6), 1263-1283. <https://doi.org/10.3846/tede.2020.13376>
- Sung, T. K. (2018). Industry 4.0: A Korea perspective. *Technological Forecasting and Social Change*, 132, 40-45. <https://doi.org/10.1016/j.techfore.2017.11.005>

Taylor, M. P., Boxall, P., Chen, J. J. J., Xu, X., Liew, A., & Adeniji, A. (2020). Operator 4.0 or Maker 1.0? Exploring the implications of Industrie 4.0 for innovation, safety, and quality of work in small economies and enterprises. *Computers & Industrial Engineering*, 139, 105486, <https://doi.org/10.1016/j.cie.2018.10.047>

Ungureanu, A. V. (2020). The transition from industry 4.0 to industry 5.0. The 4Cs Of The Global Economic Change. *LUMEN Proceedings*, 13, 70-81. <https://doi.org/10.18662/lumproc/ncoe4.0.2020/07>

Yang, F., & Gu, S. (2021). Industry 4.0, a revolution that requires technology and national strategies. *Complex & Intelligent Systems*, 7, 1311–1325. <https://doi.org/10.1007/s40747-020-00267-9>