



# ЕКОНОМІКА ТА ІННОВАЦІЙНИЙ РОЗВИТОК НАЦІОНАЛЬНОГО ГОСПОДАРСТВА

UDC 316.422.42:330.131.7

Danchenko O.I.,  
*Chairman of the Verkhovna Rada of Ukrainian Committee  
on Informatization and Communications,*  
Granaturov V.M.,  
*dr.sc.(econ.), professor, honored worker  
of science and technology of Ukraine,*  
*A.S. Popov Odessa National Academy of Telecommunications,*  
Vorobiyenko P.P.,  
*dr.sc.(techn.), professor, rector,  
honored worker of education of Ukraine,*  
*A.S. Popov Odessa National Academy of Telecommunications*

## ON THE RISKS OF A NEW TECHNOLOGICAL STRUCTURE – "INDUSTRY 4.0"

Данченко О.І.,  
*Верховна Рада України, Голова Комітету  
з питань інформатизації та зв'язку,*  
Гранатуров В.М.,  
*д-р екон. наук, професор,  
заслужений діяч науки і техніки України,*  
*Одеська національна академія зв'язку ім. О.С. Попова,*  
Воробієнко П.П.,  
*д-р техн. наук, професор, ректор,  
заслужений працівник освіти України,*  
*Одеська національна академія зв'язку ім. О.С. Попова*

## ПРО РИЗИКИ НОВОГО ТЕХНОЛОГІЧНОГО УКЛАДУ «ІНДУСТРІЯ 4.0»

*Doubt is unpleasant, but the state  
of confidence is absurd.*  
Voltaire

*The modern complexities look as intimidating as the  
opportunities that are opening up appear to be exciting.*  
K. Schwab

**Introduction.** Transformational processes that occur in the modern world are accompanied by the complication of cause-effect and functional links between the elements of the socio-economic mechanisms of society's life. They are formed under the influence of powerful socio-economic, political, technical-technological and other factors. At the present stage, the development and introduction of the latest technologies is the determining factor of the society's development, which becomes the dominant trend. The scale and speed of their development and the fundamental changes in the life of society influenced by them allow scientists to talk about the onset of a new phase (era) of social development, and describe the changes themselves as the onset of a new technological revolution.

The ongoing transformational processes require the world community to understand the reasons for their occurrence and possible consequences, to make informed decisions on the development and implementation of strategies and plans for using the emerging new opportunities, responding to possible

challenges and problems. For this understanding, it is necessary to understand, explain and determine the changes taking place in the global processes of civilization development, and the possible directions of the development of these processes in the future.

**Analysis of publications on the problem.** The World Economic Forum in Davos (WEF) is the site where the problem of the impact of new technologies on the world economy has been actively discussed in recent years. A consequence of the urgency of the problem is also the appearance in recent years of a significant number of publications in which attempts are being made to provide answers to emerging questions. The most detailed of these is the book by WEF President Klaus Schwab [1]. In it, the author states that the ongoing transformations are the fourth industrial revolution. He expresses his opinion on its possible consequences, and offers some practical ideas and solutions to help navigate the changes that are taking place to derive maximum benefit from the transformations.

At the same time, the analysis of publications on the problem shows that at present there is no unity of opinion on most of the issues under consideration, different, often conflicting views on the problem are presented. At this point, in our opinion, it is appropriate to cite, for example, the statements of some authors about the connection of the technological changes that are taking place with the processes of globalization.

Thus, in [2] it is noted that: "The new industrial era goes hand in hand with globalization, affecting all sectors in all countries." In [3], on the contrary, based on the materials of the Davos-2017 forum, the conclusion was made that the era of globalization was over. As the author notes, "No long or short list of issues to be discussed at the forum does not include one issue, in relation to which all the others are secondary. It's about ways of reforming capitalism." According to the author, this reform is extremely necessary, as the development of events in the world shows that "economic and financial globalization is nearing completion." At the same time, the author refers to the actions of Donald Trump, who, in his opinion, are an attempt at "stopping globalization or even turning it back." One can cite an opinion expressed in [4] on the given characteristics of a new stage in the development of society: "The way the next technological era looks from Davos requires a close and critical view: we are either warned about the dangers of the social challenges it generates, or programs humanity to a fatal deepening of a social inequality".

Similar and other opinions about current and future changes in the life of society caused by the development and introduction of new technologies could be developed. The main idea of these opinions, with which we fully agree, is that the ongoing processes require further understanding and justification without which it is impossible to develop a sound strategy for responding to the changes that are taking place.

This determines the relevance and urgency of this article, the purpose of which is to attempt to present a point of view on some emerging problems in the development of society at the present stage, as well as possible directions and ways to solve them.

**Results of the research.** To understand the ongoing processes, it is necessary to define a term characterizing the changes occurring under the influence of the technological development. This will allow us to formulate the name and, if possible, give a description of the form of the social life that is born under the influence of technological changes.

It is appropriate to recall the polemics in the twentieth-century scientific literature regarding the name of those changes that occurred under the influence of scientific and technological progress. The terms 'industrial', or 'the third industrial revolution' [5], 'technological', 'information revolution' [6], 'information-communication revolution' [7], etc. were offered. The term 'information revolution' was most often used, which was due to the appearance of new information technologies on the basis of the introduction of computer technologies and telecommunication systems.

At the same time, for the society that was born under the influence of these changes, different names were also used: 'postindustrial society' [8], 'post capitalist society' [9; 10], 'information society' [10; 11], 'third wave technology society' [12], etc. As in the case of the term 'information revolution', 'information society' was most often used, since, as noted in [13], it reflected a radical change in the development of civilization - the transformation of information and knowledge into the main production resource. Different names have also been used for the corresponding economic relations, - 'new, information', 'intellectual information', 'global, digital economy', etc. To the above said, we should add that today the information society is a reality recognized by the world community.

In describing the current processes, the authors also use different names: 'the fourth industrial revolution', 'the technological revolution' [1], 'Industry 4.0' [14], 'the industrial revolution 4.0' [15], 'the digital revolution' [15], etc. To characterize the results of these revolutionary transformational changes, the terms 'new industrial era' [2], 'technological era' [4], etc. are used.

Most of these names are based on the concept 'Industry 4.0', formulated by German industrialists and economists and voiced at the Hannover Industrial Fair (2011). Thus, the PWC report for 2016 notes: "In this report, the term 'Industry 4.0' means the fourth industrial revolution" [14].

It should be noted that scientific publications doubt that the current and expected changes are a revolution. As K. Schwab himself notes: "I am perfectly aware that some representatives of the scientific community and professional communities believe the processes of changes considered here to be only part of the third industrial revolution" [1, p. 9]. The author supports the use of the term 'fourth industrial revolution'

by three factors - speed, scale, and systemic nature of the changes that are taking place. At the same time, these factors are not generally accepted criteria for the formation and explanation of the established classification of previous revolutions.

It is also true that revolutionary changes in engineering and technology lead, as a rule, to changes in the forms of social and economic life. The existing civilizational approach presupposes the allocation of three stages in the worldwide civilizational process - preindustrial, industrial and postindustrial (information society). Here a natural question arises, about the type of society and its nature, which is born under the influence of the fourth industrial revolution. The answers to these questions should be sought, taking into consideration both the social and technical sides of the changes, which provide a formal approach. From this perspective, the modern scientific and technological revolution should be studied together with the new social forms that now emerge and function on the basis of new ICTs.

Therefore, these issues require further study, comprehension, and justification with the involvement of a wide range of specialists - philosophers, economists, psychologists, and representatives of engineering sciences.

Here we allow ourselves to express some considerations about the nature of the type of society that arises in the course of the changes that are taking place.

Analysis of the literature shows that in a short period of emergence of the problem under consideration, two stages have been identified. At the first stage, the emphasis, as a rule, enthusiasm was aimed at describing the fantastic opportunities that the latest technologies provide society, compiling lists that classify various technologies, the characteristics of these technologies, the forecasts of their further development, and the timing of their implementation. Today, the emphasis shifts to analyzing the potential consequences, usually negative, caused by the development of these technologies on the world economy, politics, as well as society and people.

This can be judged by the theme, moods and forecasts of the WEF, where the problems of the future economy and society are actively discussed. The general tone of the discussion on the problem allows us to claim that the existence of global risks puts the issue of the mankind survival on the agenda under the complicated natural and socio-political conditions.

Here are some of the articles about Davos-2017: "The economy of fear: why fear became the main theme of Davos-2017" [16], "Davos threatens" [17], "Davos-2017: search for a response to global threats" [18]. This was largely facilitated by the Global Risks Report of 2017 (hereinafter the Report), prepared for the Davos Forum [19]. According to the authors of the study, humanity faces global risks, with which it is not yet able to cope.

The significant risks noted in the report, the source of which are the spontaneity of natural processes and phenomena and climate change, are only indirectly related to the industrial revolution. Such risks as technological, economic and social, to a large extent, are a consequence of technological changes taking place. Uncertainty and the risks it generates, caused by the influence of the industrial revolution, are on almost every page of K. Schwab's book. "The development and implementation of new technologies are associated with uncertainty and mean that we do not yet have an idea of how the transformations resulting from this industrial revolution will develop in the future" [1, p. 8]. "At the moment, the consequences of the fourth industrial revolution remain unclear" [1, p.40]. "We only imagine to a limited extent what the limits of the possibilities of new technologies are, and what awaits us ahead in this area. This also applies to the sphere of international and internal security" [1, p.70]. His statement, made in the epigraph of this article, also supports this.

The changes that have taken place only increased the perception of the risk becoming one of the forming factors of the modern and, especially, future society. Here it is worth recalling the appearance at the end of the 20th century of the works of Ulrich Beck (Beck U.) and Robert Schwebler (Schwebler R.) [20; 21], in which the authors suggest the beginning of the process of forming the newest phase of development of society - the "risk society". Under the society of risk, a post-industrial formation is understood. This differs from the industrial by a number of radical features. The main one is that if the distribution of goods is characteristic for an industrial society, then for the risk society it is the distribution of threats and the resulting risk. The main problem of the future will be the need to reserve funds for the implementation of counter-measures and mitigate the negative consequences of the onset of risk events [22].

Such statements have real grounds. The allocation by the US Congress in 2008 of a huge amount of funds to support the endangered American banks and companies is an example. The European Financial Stability Fund, created for such situations, which has hundreds of billions of euros, is also supportive. In addition, there was the creation of the corresponding Stabilization Fund in the Russian Federation.

Obviously, the main problem is the prevention of possible risks or the greatest possible reduction in the negative consequences of their occurrence.

It is alarming that today there is no "consistent, positive and united concept at the global level that could determine the opportunities and challenges of the fourth industrial revolution" [1, p.12].

Under existing conditions, the development and implementation of traditional, widely-used practices and effective counter-measures - insurance, diversification, limitation, etc. [22], are insufficient. It is

necessary to create a regulatory and legal concept that allows the formation of Norms and Rules, providing the necessary legal, regulatory and ethical constraints. The rules of interaction, the code of conduct, the principles of international interaction and the order of the international community's response to manifestations of various kinds of risks should be reviewed. It is necessary to form international stabilization funds, rapid response units for natural and climatic, technical and technological risks, and many others. These and other issues should be put into practice. Specific measures and measures to ensure mitigation of the negative consequences of the onset of risk events should be developed. It is time for the world community to move on to developing a real strategy for collective answers to global threats and challenges.

The development of a consistent concept that mitigates the negative consequences of global risks must be based on a comprehensive and unified scientific understanding of their nature, as well as the composition and nature of manifestation. Despite the significant number of works on the problems of risk, the existing methods of analysis and quantification of risk cannot always be an effective tool for analyzing and countering the manifestation of global risks. They do not take into account the catastrophic consequences caused, for example, by unexpected changes in a state's economic policy, crises, natural disasters, and so on. The economic upheavals and crises that have occurred in recent years in different countries and regions of the world have led many scientists and specialists dealing with the problems of risk to revise the views and approaches to this problem to some extent. At the same time, the issues of scientific justification of methods for the analysis and assessment of global risks are not sufficiently studied. This, first of all, concerns the composition of global risks, their verbal definition and characteristics, as well as the construction of a system for classifying these risks. Consider this statement on the example of the Report mentioned, which summarizes scientific developments in the field of global risks [19].

One of the most important tasks of risk analysis is the finding and identification of all possible risks that may arise. To do this, it is necessary to have data on a large number of risks that form the concept of "volume" of the risks of the studied process or phenomenon. The role of the instrument that allows to solve this problem is to classify risks. In addition to identifying and justifying the composition of risks, it allows the placement of each of them in the common system, creates opportunities for application, corresponding to each risk of specific methods and methods of risk management [22]. At present, there is no classification of global risks, which slows down the practice in this area. One of the reasons for this situation is the discussion presented in the Report, the composition of global risks, their characteristics, as well as the places in the presented group.

The report presents five groups of risks: economic, environmental, geopolitical, social, and technological, combining a certain number of types of global risks. As the analysis shows, as part of global risks, instead of risks, sources of risks, risk factors, consequences of occurrence of risk events, etc. are listed. Discussion is also about risks within a group. The attribution of certain risks to a particular group is also to be discussed.

Consider, for example, the list of global risks that are part of the environmental risk group. Here such risks are highlighted: extreme weather events; non-compliance with measures to mitigate and adapt to climate change (failure of climate-change mitigation and adaptation); major biodiversity loss and economic collapse. The first two risks are the source of the risk, and the third - the consequence of the onset of a risky event. As we pointed out in [22], in order to exclude the appearance of risks that are inherently not such, the risks must answer the question, which ones they are. This condition is met by the names of the four risk groups presented in the report. It is advisable, for uniformity, to call this group '*environmental risks*'. Sources of risks and consequences of the onset of risk events were also used in the formation of global risks, combined into groups of economic and social risks.

The implementation of the cause-and-effect approach in describing and grouping global risks presupposes the practicality of identifying also such risks as natural-climatic and criminal-legal risks.

So, the global risk "Massive incident of data fraud/theft" is included in the technological risks. The following description of this risk is given: "The misuse of private and official data, which occurs on an unprecedented scale." Since such use may be the result of abuse by technical and other personnel who have access to these data, as well as various criminals, they should be attributed to a group of criminal and legal risks. This group can also include such global risk as large-scale cyber-attacks.

Such an analysis of the underlying assumptions and proposals regarding the list of risks, characteristics and risk grouping could be continued. The results of the analysis testify both to the complexity of the problem and to the insufficient scientific elaboration of a number of fundamental sections of the theory of risk. Solving the problem will create opportunities for an informed choice of methods and techniques for managing global risks, improve the effectiveness of decisions taken to prevent or reduce the adverse consequences of their occurrence.

**Conclusions.** The ongoing rapid development and introduction of the newest technologies has an extremely controversial impact on the entire course of modern world economic development. It raises a number of painful problems and puts the world community in front of serious challenges. In a concentrated form, these problems and challenges are formulated in the Report. It identifies key global risks for the international community. The list of the most dangerous of them was headed by unfavorable weather

conditions and natural disasters, an unstable geopolitical situation, the possibility of abuse of new technologies, as well as a number of economic and social risks.

Most of these risks the society faced in previous years. At the same time, experts note, the world community for the first time in its history faces such a complex of powerful, interrelated global long-term problems. Today we should already move from finding and discussing existing problems to real measures to address them.

To solve the problems that have arisen, it is necessary to create a normative and legal concept for the international community's response to emerging challenges, allowing the formation of Norms and Rules that provide legal, regulatory and ethical provisions. Where appropriate and possible, interstate economic, organizational structures and institutions should be established to ensure effective response to emerging threats. The first step here should be the creation of an appropriate Roadmap, based on the probability and severity of the consequences of the onset of specific global risks. It is necessary to outline and prioritize consistent and successive steps to solve existing problems.

As the analysis shows, the insufficient scientific research in addressing the issues of a number of key provisions of the theory of global risk restrains the practice in this direction. Therefore, the increasing role and importance of global risks in the life of society require a thorough and comprehensive study of them. It is about the composition of global risks, their verbal definition and characteristics, as well as the construction of a system for their classification. This will allow developing effective methods, measures and measures for risk management, create conditions for mitigating the consequences of the onset of global risks on the economic, social, cultural and humanitarian environment of mankind.

### Bibliography

1. Шваб К. Четвертая промышленная революция / К. Шваб. – «Эксмо», 2016. – (Top Business Awards). – 138 с.
2. Галкин С. Промышленная революция 4.0 [Электронный ресурс] / С. Галкин. – Режим доступа: <https://reed.media/ir4/>
3. Катасонов В. Давос-2017 как символ завершения эпохи глобализации [Электронный ресурс] / В. Катасонов. – Режим доступа: <http://vybor.ua/article/economika/davos-2017-kak-simvol-zaversheniya-epohi-globalizacii.html>
4. Мануков С. 4-я промышленная революция в Давосе [Электронный ресурс] / С. Мануков // «Expert Online». – 2016. – Режим доступа: <http://expert.ru/2016/01/21/chetvertaya-promyishlennaya-revolyuetsiya/>
5. Надель С. Вероятность и перспективы будущей индустриальной революции / С. Надель // *Мировая экономика и международные отношения*. – 2002. – № 9. – С. 26–37.
6. Вайнштейн Г. От новых технологий к «новой экономике» / Г. Вайнштейн // *Мировая экономика и международные отношения*. – 2002. – № 10. – С. 22–29.
7. Эльянов А. Глобализация и догоняющее развитие / А. Эльянов // *Мировая экономика и международные отношения*. – 2004. – №1. – С. 3–16.
8. Bell D. *The Coming of Post-industrial Society : A Venture in Social Forecasting* / D. Bell. – N.Y. : Basic Books, Inc., 1973. – 507 p.
9. Дракер П. Посткапиталистическое общество / П. Дракер // *Новая постиндустриальная волна на Западе. Антология*; под ред. В. Л. Иноземцева. – М. : Academia, 1999. – С. 70–100.
10. Masuda Y. *The Information Society as Postindustrial Society* / Y. Masuda. – Washington : World Future Soc., 1983. – 171 с.
11. Кастельс М. *Информационная эпоха: экономика, общество и культура* : пер. с англ. / М. Кастельс. – М. : ГУ ВШЭ, 2000. – 608 с.
12. Тоффлер Э. *Третья волна* / Э. Тоффлер // *США – экономика, политика, идеология*. – 1982. – № 4. – С. 7–11.
13. Чухно А. *Актуальные проблемы стратегии экономического и социального развития на современном этапе* / А. Чухно // *Экономика Украины*. – 2004. – № 4–5. – С. 15–23, С. 14–23.
14. *Всемирный обзор реализации концепции «Индустрия 4.0» за 2016 год* [Электронный ресурс]. – Режим доступа: [www.pwc.com/industry40](http://www.pwc.com/industry40)
15. Доклад о мировом развитии 2016. *Цифровые дивиденды* [Электронный ресурс]. – Режим доступа: <http://www.inesnet.ru/wp-content/uploads/2016/01/WorldDevelopment010dividends0overview.pdf>
16. Макаров О. Экономика страха: почему опасения стали главной темой Давоса-2017 [Электронный ресурс] / О. Макаров, А. Фейнберг. – Режим доступа: <http://www.rbc.ru/economics/19/01/2017/587fc45b9a7947d796bb27fd>
17. Давос угрожает [Электронный ресурс]. – Режим доступа: <http://www.economica.com.ua/top/article/1039769.html>
18. Давос-2017: поиск ответов на глобальные угрозы [Электронный ресурс]. – Режим доступа: <http://www.vestifinance.ru/articles/79938>

19. The Global Risks Report 2017 12th Edition [Электронный ресурс]. – Режим доступа: [http://www3.weforum.org/docs/GRR17\\_Report\\_web.pdf](http://www3.weforum.org/docs/GRR17_Report_web.pdf)
20. Beck U. Risk Society: Towards a New Modernity / U. Beck. – London: Sage Publications Ltd, 1992. – 298 p.
21. Schwebler Robert. Individualversicherung in Wirtschaft und Gesellschaft / Robert Schwebler // Versicherungswirtschaft. – 1990. – № 1. – S. 12.
22. Гранатуров В.М. Экономический риск: сущность, методы измерения, пути снижения: учебное пособие / В.М. Гранатуров. – 4-е изд. перераб. и доп. – М. : Дело и сервис, 2016. – 288 с.

### References

1. Shvab, K. (2016), *Chetvertaya promyshlennaya revolyutsiya* [The Fourth Industrial Revolution], «Eksmo», 138 p.
2. Galkin, S. (2016, May), "Industrial Revolution 4.0", available at: <https://reed.media/ir4/> (access date October 01, 2017).
3. Katasonov, V. (2017), "Davos-2017 as a symbol of the end of the era of globalization", available at: <http://vybor.ua/article/economika/davos-2017-kak-simvol-zaversheniya-epohi-globalizacii.html> (access date October 01, 2017).
4. Manukov, S. (2016), 4th Industrial Revolution in Davos. Expert Online, available at: <http://expert.ru/2016/01/21/chetvertaya-promyshlennaya-revoljutsiya/> (access date October 01, 2017).
5. Nadel, S. (2002), "Probability and prospects of the future industrial revolution", *Mirovaya ekonomika i mezhdunarodnyye otnosheniya*, no. 9, pp. 26-37.
6. Vaynshteyn, G. (2002), "From new technologies to the "new economy"", *Mirovaya ekonomika i mezhdunarodnyye otnosheniya*, no. 10, pp. 22-29.
7. Elianov, A. (2004), "Globalization and catch-up development", *Mirovaya ekonomika i mezhdunarodnyye otnosheniya*, no. 1, pp. 3-16.
8. Bell, D. (1973), *The Coming of Post-industrial Society: A Venture in Social Forecasting*, N.Y.: Basic Books, Inc., 507 p.
9. Draker, P. (1999), "Post-capitalist society", *A new post-industrial wave in the West. Anthology*, pp. 70-100.
10. Masuda, Y. (1983). *The Information Society as Postindustrial Society*, Washington: World Future Soc., 171 p.
11. Kastels, S. (2000), *Informatsionnaya epokha: ekonomika, obshchestvo i kultura* [Information era: economy, society and culture], GU VSHE, Moscow, Russia, 608 p.
12. Toffler, E' (1982), "The Third Wave", *SSHA – ekonomika, politika, ideologiya*, no. 4, pp. 7-11.
13. Chukhno, A. (2004). "Actual problems of the strategy of economic and social development at the present stage", *Ekonomika Ukrainy*, pp. 15-23, pp. 14-23.
14. World review of the implementation of the concept of "Industry 4.0" for 2016 (2017), available at: [www.pwc.com/industry40](http://www.pwc.com/industry40) (access date October 01, 2017).
15. World Development Report 2016. Digital dividends (2017), available at: <http://www.inesnet.ru/wp-content/uploads/2016/01/World0developm0l0dividends0overview.pdf> (access date October 01, 2017).
16. Makarov, O. and Feynberg, A. (2017), "The economy of fear: why fears became the main theme of Davos-2017", available at: <http://www.rbc.ru/economics/19/01/2017/587fc45b9a7947d796bb27fd> (access date October 01, 2017).
17. "Davos is in danger" (2017), available at: <http://www.economica.com.ua/top/article/1039769.html> (access date October 01, 2017).
18. "Davos-2017: searching for answers to global threats" (2017), available at: <http://www.vestifinance.ru/articles/79938> (access date October 01, 2017).
19. "The Global Risks Report 2017 12th Edition" (2017), available at: [http://www3.weforum.org/docs/GRR17\\_Report\\_web.pdf](http://www3.weforum.org/docs/GRR17_Report_web.pdf) (access date October 01, 2017).
20. Beck, U. (1992), *Risk Society: Towards a New Modernity*, Sage Publications Ltd, London, 298 p.
21. Schwebler, Robert (1990), "Individual insurance in business and society", *Versicherungswirtschaft*, no. 1, p. 12.
22. Granaturov, V.M. (2016), *Ekonomicheskij risk: sushchnost, metody izmereniya, puti snizheniya* [Economic risk: the essence, methods of measurement, ways to reduce], tutorial, 4 th ed., corrections and additions, Delo i servis, Moscow, Russia, 288 p.