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REWOLUCJA PRZEMYSŁOWA 4.0 I INNOWACYJNA PRACA: TRENDY, WYZWANIA, PROGNOZY

4-Я ПРОМЫШЛЕННАЯ РЕВОЛЮЦИЯ И ИННОВАЦИОННЫЙ ТРУД: ТРЕНДЫ, ВЫЗОВЫ, ПРОГНОЗЫ

THE 4TH INDUSTRIAL REVOLUTION AND INNOVATIVE LABOR: TRENDS, CHALLENGES, FORECASTS

Abstract: The society is driven by the cyclical effect of the technological progress, which transforms the economy and changes the demand and supply notions within the labor market. However, today's changes, namely the 4th Industrial Revolution, have a number of features, among which the most significant is transforming the role and place of people in the production, economy, and life. This notion has both positive and negative trends. On the one hand, the potential of some economies will grow, thereby bringing high profits; however, on the other hand, many people will be unemployed, which once again requires much effort from the state and business to equalize the imbalance between supply and demand on labor sources. The authors of the article attempted to reveal the basic trends of the 4th Industrial Revolution in Ukraine, to predict some possible risks and changes, and to justify the strategic directions of the country's development in face of the new environment.

Key words: the 4th Industrial Revolution, the 4.0 Industry, innovative labor, creative economy, knowledge economy, labor market.

Аннотация: Общество с определенной цикличностью ощущает на себе влияние технического прогресса, который преобразует экономику, изменяет спрос и предложение на рынке труда. Но сегодняшние изменения – 4-я промышленная революция – имеет ряд особенностей, среди которых наиболее значимое – трансформация роли и места человека в производстве, экономике, жизни. Все это имеет как позитивные, так и негативные тренды. С одной стороны возможности некоторых экономик будут расти, принося высокие прибыли, а с другой – множество людей может оказаться безработными и потребуются немало усилий государства и бизнеса, чтобы уравновесить дисбаланс спроса и предложения на рабочую силу. Авторы статьи попытались в статье раскрыть основные тренды 4-й промышленной революции в Украине, спрогнозировать возможные риски и изменения, а также обосновать стратегические направления развития страны в новых условиях.

Ключевые слова: 4-я промышленная революция, индустрия 4.0, инновационный труд, креативная экономика, экономика знаний, рынок труда.

Streszczenie: Społeczeństwo z pewną cyklicznością odczuwa wpływ postępu technologicznego, który przekształca gospodarkę, zmienia popyt i podaż na rynku pracy. Ale dzisiejsze zmiany – czwarta rewolucja przemysłowa – mają wiele cech, wśród których najważniejsze jest przekształcenie roli i miejsca człowieka w produkcji, gospodarce, życiu. Wszystko to ma zarówno pozytywne, jak i negatywne tendencje. Z jednej strony szanse niektórych gospodarek będą wzrastać, przynosząc wysokie zyski, z drugiej strony wiele osób może zostać bezrobotnymi, co wymaga wiele wysiłku ze strony państwa i przedsiębiorstwa, aby przywrócić równowagę między podażą a popytem na pracę. Autorki artykułu podjęły próbę ujawnienia głównych kierunków IV rewolucji przemysłowej na Ukrainie, prognozowania możliwych zagrożeń i zmian, a także udokumentowania strategicznych kierunków rozwoju kraju w nowych warunkach.

Słowa kluczowe: 4 rewolucja przemysłowa, przemysł 4.0, innowacyjna praca, gospodarka kreatywna, gospodarka wiedzy, rynek pracy.

JEL: J81, O31

Introduction

Rapid innovation, drastic technological transformation of the material world, and the growing number of scientific inventions are ultimately changing the production and principles of housekeeping, meanwhile leading to significant changes in the labor market. A quantitative analysis of scientific inventions shows their growth over the last 400 years with a rapid acceleration in the last century. The qualitative impact of these inventions on the economy and the labor market is evident from the emergence of new jobs and new qualification requirements of the employees. For instance, the invention of the steam engine along with associated innovations within the industry have radically changed the structure of the labor market. As a result of changes, according to P. March, the percentage of the British industry employees from 1700 to 1890 rose from 22% to 43%, while the corresponding agricultural index decreased from 56% to 16% (Марш, 2015, p. 18). The „Transport Revolution” (the emergence of railway connections) at the end of the 19th century served as a driving force for the economy, facilitating trade relations. At this time, new sectors of the economy and service industry emerged, and the labor market was in demand of new jobs. A structural change in the number of industrial production employees in favor of the service industry can be visible now. Moreover, every year we witness an increasing debate about the complete replacement of people by robots in their workplace.

By changing technologies, mankind is radically changing the environment. Therefore, N. Vinner's words (Vinner, 1958, p. 57-58) are relevant today: “Many of us do not understand that (...) such a speed at which the changes occurred has never before been witnessed in our history. This also concerns the very nature of these changes. (...) We have drastically changed our environment to such an extent, that now, in order to exist in this environment, we must change ourselves.” It is therefore of particular importance now to objectively evaluate all the risks and benefits of the technological progress in order to maximize the benefits for each individual, state, and the society at large. The future generations should also not bear the consequences of the technical progress. The relevance of innovation in the strategies of enterprises and states is also highlighted by the fact that, in 2016, the main topic of the World Economic Forum in Davos was the fourth Industrial Revolution (World Economic Forum, 2016).

THE ESSENCE OF THE 4TH INDUSTRIAL REVOLUTION AND INNOVATIVE LABOR

The digital economy, the Internet of things, and the large amount of data have transformed the production chains and automated most of the production operations. Therefore, it is quite common to equate the concepts of the 4th Industrial Revolution and the 4.0 Industry. Our study proves that the 4.0 Industry is a platform for creating a „smart enterprise” and constitutes itself

as a starting position for the 4th Industrial Revolution. The concept of the 4.0 Industry was introduced in Hanover at the Industrial Fair in the context of Germany's Innovative Development Strategy. Initially, it was an initiative of the German government and business aimed at strengthening Germany's innovative leadership position in the world. The concept was based on the principles of ergonomics:

- the functional compatibility of man and machine, i.e. the possibility of contacting a person with equipment directly over the Internet;
- the transparency of information and the ability of systems to create a virtual copy of the physical world.
- the technical assistance of people through machines, that is, the execution of numerous sensitive tasks by remote technology;
- the ability of systems to make decisions independently and autonomously.

Progress means not only to enhance the integration of „cyber physical systems”, or CPSs, into the factory processes. The essence of a complex innovation policy is creating integrated chains of innovation: From creative ideas to new products and services. Five basic elements of the innovation policy have been identified: enhancing competitiveness by prioritizing the value of creativity and quality of life; strengthening cooperation and supporting implementation through networking and information transfer; improving value creation by accelerating innovation in industry; providing a foundation for creativity and innovation by developing favorable infrastructure conditions; stimulating proactive thinking through transparency and publicity (The new High-Tech Strategy..., 2016, p. 14). Therefore, the 4.0 industry and the 4th Industrial Revolution should not be equalized as the latter reflects a broader concept.

After having analyzed several publications, we agreed with the proposed definition of the 4th Industrial Revolution, presented on the website of the Technical Terminology Handbook: “The fourth industrial revolution is the current and developing environment in which disruptive technologies and trends such as the Internet of Things (IoT), robotics, virtual reality (VR) and artificial intelligence (AI) are changing the way we live and work” (Fourth industrial revolution, 2017). A peculiar feature of the 4th Industrial Revolution is its multi-morality, its depth of changes affecting all spheres of human life, as well as the transformation of perceptions about the human beings themselves and their objectives. The content and nature of labor conditions are already being changed, which both is and will be a result of the 4th Industrial Revolution in the future.

The speakers at the Forum in Davos (2016) (World Economic Forum, 2016) defined such main elements of the 4th Industrial Revolution as artificial intelligence, the Internet of things, unmanned transport, 3D printing (including medicine), nanotechnology, biotechnology, quantum computers, cloud technology, developing ways of collecting and analyzing information through Big Data, crowd-sourcing, and sharing economy (*Четвёртая*

промышленная революция, 2015). Working with such technologies demands a great amount of sophistication and creativity. Therefore, working with IT technologies is considered to be innovative. Petrova L. describes work in the field of research as innovative, focusing on the content and result of work: „(it is) creative, innovative, designed to produce a qualitatively new product and a positive socio-economic impact from its introduction” (Колот, Гнибіденко & Герасименко, 2015, p. 143).

Sometimes, the hand-made industry is equalized with innovative labor. It's connected more with the creative component of work and the creative industries research (Higgs & Cunninham, 2008). When activities are based on individual creativity, talent, and skills which have the potential to create tangible assets and jobs through the creation and exploitation of intellectual property (Higgs & Cunninham, 2008). At the same time, research within the creative industries shows perfectly clear that the hand-made industry has a low percentage of profitability growth due to traditional ways of production. The authors believe that the creation of new scenes (as part of the hand-made work is creative) along with the execution of ideas, that is, the way of production, shows that the production technology is not innovative. That is why this type of activity can only partially be considered as innovative.

At the same time, the authors emphasize that innovative labor cannot always be evaluated, as it does not necessarily result in a material product. According to the authors, the defining features of intellectual labor should be: a high degree of mental effort and responsibility, creativity, individualization of labor processes, and the „freedom of thought”. In fact, the product of intellectual work can be comprised of knowledge of any nature, information, objects, services, as well as the personal qualities and values that have been formed (Поплавська, 2015, p. 60-65). On this basis, innovation is an activity that has distinctive characteristics related to the nature and content of the work (described above), and which is the result of a profound change in understanding the role and place of the individual in the social and economic system and nature.

TRENDS AND CHALLENGES OF THE 4TH INDUSTRIAL REVOLUTION

The main trends that have emerged in the world due to the 4th Industrial Revolution are the following:

- changing the nature and content of work (most of the economic sectors that work with huge databases significantly reduce routine work such as accounting, metrology, auditing, etc.);
- increasing the speed of the „from order to result” processes, which facilitates the operation of the goods and services market and increases the level of consumer satisfaction;

- globalization, as manifested in the increased demand for mobility of both production and, more so, labor resources;
- changing the „polarity of economies” when the world is differentiated not by the volume of production, but by the level of technology, mechanisms, and knowledge; developing global production chains and specialization of regions;
- profound changes in the social dimension of human life.

Confirmations to this can be found in various studies. Thus, P. March noted a significant increase in the demand for highly educated and qualified employees against a backdrop of declining employment among undereducated US citizens: „Between 1992 and 2009, the number of highly educated qualified employees increased from 0.8 to 1.2 million people (43%). At this same time, the number of employees with relatively low qualifications, judging by the level of education obtained in the educational institution, was reduced by roughly the same proportion from 11.3 to 6.7 million people” (Марш, 2015, p. 404). Also in the World Economic Forum Report „The Future of Jobs. Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution” (2016), it has been emphasized that, till 2020, the changes will have a negative impact on the employment in such sectors as office and administrative work (an average drop of 4.91%), entertainment, sports and media (an average drop of 1.03%); at the same time, demand will increase in areas such as computers and mathematics (an average increase of 3.21%), architecture and engineering (an average increase of 2.71%) (*The Future of Jobs*, 2016, p. 12).

The 4th Industrial Revolution already influences people's relationships by making communication more „digitized”, erasing the borderline between the virtual and the physical world; the emergence of new ethical principles; the understanding of individual liberty. However, the influence of the 4th Industrial Revolution is not limited to the level of the individual and the enterprise, it is rather „entwined” into the state „machine of control”. The new technologies have enabled citizens to influence the political life of their state; on the other hand, they are intensifying the security problems. For example, our modern reality has given life to hybrid wars, which have a completely different nature, pose cyber threats, and increase the uncertainty (Горбулін, 2017, p. 19). According to K. Schwab, „the border between war and peace, soldier and civil man, and even violence and non-violence (cyber-terrorism) proves to be frighteningly blurred. With the development of military technologies, and the emergence of biological and autonomous weapons, non-governmental groups of people have achieved the same level of lethality as states. (...) In addition, the decay of the middle class can lead to the disconnection of political systems, to the strengthening of the populism, radicalism, fundamentalism, and militarism ideas, the uprise of which we can already witness now” (Шваб, 2016, p. 1).

Of course, such trends, which are directly related to employment, pose challenges to every individual and government; accordingly, these challenges require a balanced and comprehensive solution. In addition, these challenges are related to the knowledge and skills of everyone entering the labor market. In view of this, nowadays, it is necessary to think about training specialists who are capable of effectively using the modern technologies today and developing them in the future.

The deindustrialization of the Ukrainian economy, high levels of the shadow economy and corruption combined with the impoverishment of the population constrain domestic demand for innovation (Згуровський, 2015). The global innovation index of Ukraine is 50 among 127 countries, which were evaluated. Despite the fact that about 4% of the products in Ukraine are innovative (the IT-sector, products of the military industrial complex, airplane and rocket construction), the country has not yet reached the top list of the 4th Industrial Revolution's members. Unfortunately, the participants of the Kiev International Economic Forum (October 2016) noted the low activity of the industrial automatization market. In addition, the participants of the Kiev International Economic Forum noted that the Ukrainian economic model has a number of negative risks. First, the sudden increase in the number of labor migrants (in 2016, they reached up to 6-8 million people, which is approximately 40 per cent of the economically active Ukrainian population). The money transmission ratio of labor migrants to foreign direct investment amounted to 1.6: 1. An in-depth analysis of this trend shows that Ukraine, as a state, has a high probability of loss (fall short gross domestic product (GDP)) in the future, despite the investment resource of migrants. The problem is that, in the long term, the decrease of the country's labor force potential will have a negative impact on the dynamics of macro indicators (GDP, productivity of labor). Ukraine's labour force are very competitiveness and educated, and hardworking. The Ukraine human capital development is 41 (from 127) in Global Innovation Rating. The Ukraine Global Competitiveness Index shows high education. It's 33 from 138. Losing now human capital – the driver of the 4th Industrial Revolution, the state condemns itself to preserving the traditional structure of the economy with the main trend – deinternalization-deindustrialization. Thus, in case of developing the most likely Foresight scenario, the notion of innovative labor will not be implied to Ukraine for a long time afterwards. Secondly, we witness the violation of intellectual property rights, primarily through the growth of non-licensed software in Ukrainian companies, which reached 82% (in the public sector – 70%). Thirdly, we face the growth of the shadow economy sector, which is estimated from numerous sources to range from 34 per cent of GDP (Загальні тенденції економіки в Україні, 2016) to 50-52% of GDP (Україна 2030..., 2017, p. 30). Cyprus, the leading foreign investor in the Ukrainian economy, points at the speculative nature of the investment, which does not encourage innovation.

It would be incorrect to assume that employers do not want to introduce innovation in their businesses. Resistance of the middle level management while introducing new technologies and automating management functions is an extremely negative phenomenon. In a private conversation of the Ukrainian SAP (Ukrainian office of the German software corporation SAP SE) representatives with the authors of this article, the developers noted sabotaging actions particularly from the side of middle-level managers. In Ukraine, it is also connected with the changes in overall macroeconomic conditions, such as increased inflation and a decline in the disposable income of the population. Low social assets, mistrust and inefficient communication can lead to conflicts between employees and company leaders while introducing innovation. An increase in the activity of trade unions, ready to protect employees' rights and to preserve jobs in a particular enterprise, can also often be witnessed. In our opinion, the employees' concerns about losing their job can occur in case of the employer's low social responsibility and lack of awareness among the staff members themselves. In general (the relevant rules of the Council Directive 98/59/EC from July 20th, 1998 on collective dismissals are also in force in Ukraine), in cooperation with trade unions, employers prepare programs that include retraining or finding a new suitable workplace for the employees.

Considering the level control of risks during the 4th Industrial Revolution, the experience of the German trading company Otto, which has automatized the sales process, is of most interest to us. As a result, they have increased productivity, and Otto customers now are getting their orders sooner and are therefore more likely to remain loyal to the company. According to Callum Brodie, „Robots will inevitably suffer glitches, need updates and require new parts. As companies rely more and more on automation, they will require more people with technical skills to maintain, replace, update and fix AI technology. A 2011 study by the International Federation of Robotics found that one million industrial robots directly created nearly three million jobs, while a more recent study published last month states that less than 10% of jobs are fully automatable” (Brodie, 2016, p. 1).

RISKS ON THE LABOR MARKET

The origins of labor market risks in connection to the 4th Industrial Revolution can be found in the basic definition of ergonomics, namely the distribution of functions between machinery and humans in the system (determination of the responsibility amount and the level of access to human decision-making). Thus, the more intellectual the system („man-machine”) in which the human represents the function of the consumer (for usage), is, the more „modest” will be his qualification requirements. In addition, the human will be empowered to perform the system monitoring functions. In this case, higher requirements will be imposed upon the employee. Consequently, the number of employees who use and control the systems will be decreasing along with the demand for them on the labor market. At the same time, performing repair

functions and designing intelligent systems will require a more qualified personnel. The manager of Cisco Chuck Robbins writes the following about the need for a team of newly-qualified employees, „there is a worldwide shortage of trained personnel in the field of information security (...) According to the Cisco Information Security Annual report, only 45% of companies are able to determine the scope of the attack and eliminate its effects” (Индустрия 4.0..., 2016, p. 1).

It can clearly be confirmed that any industrial revolution brings some fundamental changes into the structure of the labor force. „Restructuring” of any kind carries the risk of imbalancing the needs and demands of workforce. Unfortunately, one peculiar feature of the 4th Industrial Revolution is also extending the level of inequality in education, as well as exceeding the demand of labor. Apparently, the proportion of labor in production costs will be declining; however, this is not a result of poor quality of labor, but rather the replacement of human labor by corresponding assets. Carl Benedict Frey and Michael Osborne wrote the following: „Over the past few years, the vast majority of developed countries, as well as rapidly growing global economies such as China, have experienced a significant percent drop in the GDP labor proportion. Such a drop is mostly the result of a decline in the relative price of the production means” (Frey & Osborne, 2015, p. 7).

The 4th Industrial Revolution has resulted in the development of informal employment and non-standard forms of employment, which have mostly contributed to the phenomenon of precarization. Due to precarization, uncertainty as for the future arises; thus, the possibilities for quality education etc. are reduced (Поплавська, 2015, pp. 60-65). In addition to this, informal employment and non-standard forms of employment pose new challenges while building a state employment policy, imposing taxes, and assigning social benefits (pensions, temporary incapacity to labor, etc.). Thus, innovative labor requires new solutions in the area of public administration.

It should also be noted that stratification of the society will be among the risks of the 4th Industrial Revolution. Those who sell intellectual products, owners of „physical assets, investors, and shareholders will mostly benefit from this process... This explains the growing rift in wealth between those who live from the results of their own labor and those who own assets. It also explains the frustration of many employees who are convinced that they will never be able to increase their real income and that their children will never live better than they are now” (Шваб, 2016, p.15).

It is therefore necessary to understand and be prepared to the requirements of the market, that is, to teach and acquire the knowledge and skills that are needed in the new technological structure of the society.

REQUIREMENTS TO THE EMPLOYEE OF THE FUTURE

As it was already mentioned, the labor market is rather harshly reacting to the technological changes by „kicking out” administrative and office employees into the market. At the same time, IT professionals will be in great demand. A scientist from the Nuremberg Institute of Labor Market Research (IAB) Enzo Weber believes that „it is not necessary to fear the changes because the know-how in sensor technology and mechanical engineering will provide the country with a competitive advantage” (Индустрия 4.0..., 2016, p. 1).

According to the WORK GARANT company, a shortage of medical personnel (doctors, nurses) can be observed in many European countries. For instance, according to official data, Germany is lacking approximately 20 percent of doctors, and about 3,000 vacancies in 2013 remained untaken. A similar problem has been observed in Denmark. To compensate for the lack of white robes, European states have resorted to measures such as helping foreign specialists to legalize diplomas, providing free language courses, etc. Moreover, the greatest demand can be witnessed not for general practitioners, but rather for narrow-profile specialists such as anesthesiologists, neurologists, radiologists, oral surgeons, etc. (Работа за границей..., 2014).

The DW Internet edition has published its study of the German labor market needs. According to this document, the most demanded future jobs will include the following: construction engineer and power engineer; information security specialist; software developer; mathematical economist; sales manager; mechatronics engineer; food industry technologist; elderly care specialist; doctor; mathematics and natural science professor (Карстен, 2015). Based on this, the employee of the future must possess cognitive and physical abilities (advanced thought processes and physical stress resistance) and communication, socialization, process, systemic, professional, and managerial skills. The authors agree that a society dominated by technology and products (services), like the one of the 4th Industrial Revolution, will be in great demand of employees whose professional profile will be evaluated by the skills and abilities presented in Figure 1.

However, not all countries find these requirements relevant. Applying innovative labor is closely linked to the existence of innovative economic areas in the state. Requirements to the employees in the state will depend on the stage of its economic development: whether those are developed countries, countries with emerging economies, or poor and marginalized countries. Thus, if Ukraine were to develop only its agricultural sector in the context of global specialization, the labor market of the future would not produce the need to develop such skills as system analysis or programming. The possibility of implementing the World Economic Forum's scenario (Scenarios for Ukraine, 2014) and shifting Ukraine to the category of „lost countries” can be indicated by the labor market trends towards the lack for innovative work.

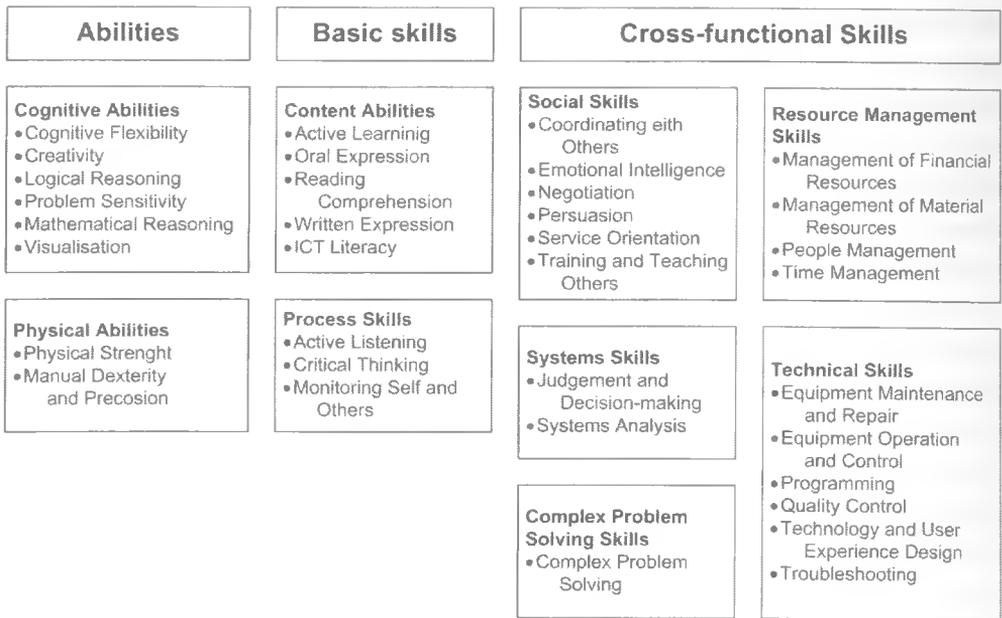


Figure 1. Main competencies of the employee

Source: (*The Future of Jobs...*, 2016, p. 21).

An analysis of Ukrainian labor market's current state shows that from 2013 to 2016, the demand of enterprises and organizations for labor force decreased from 47.5 to 36.0 thousand people (i.e. 24.2%). Furthermore, as for the professional classification, the demand has mostly decreased for the following jobs:

- legislators, leading government officials, directors, managers (managing directors) – up to 37.2%;
- professionals – up to 42.0%;
- specialists – up to 27.8%;
- trade and service employees – up to 23.8%;
- common jobs – up to 32.5%.

As for „qualified employees with tools”, the demand for this group has increased by 12.2%. This can be explained by the further deindustrialization of the Ukrainian economy. Unfortunately, in 2017 (during the period of January-May), 71 people on the average claimed for 10 vacancies. This information can be confirmed by the largest electronic vacancy portal, the Work.ua website. According to Work.ua, in the context of various spheres of activities, the labor supply in relation to the existing demand is exceeded on average by more than 440% (for example, if 15 people apply to 1 IT vacancy, concerning 1 lawyer vacancy, we can see approximately 72 applications there). Moreover, according to employers, with such a broad supply of candidates, it is very difficult for them to find, for instance, really qualified lawyers.

We find it equally sad that there is little demand among employers for unique professional skills. All this shows that the Ukrainian labor market has not yet been affected by global trends and has not, in general, formed a request for innovative labor.

STATE AND BUSINESS: FINDING SOLUTIONS TO ADDRESS THE CHALLENGES OF THE 4TH INDUSTRIAL REVOLUTION

One of the most serious challenges to the modern functioning of the economy is the imbalance of the labor market: the discordance between demand and supply of labor. A large percentage of employees work not according to their occupation. While choosing a profession, school graduates are guided by the respective structure, condition, and trends of the labor market. The training of a specialist requires at least four years of studies; with the modern dynamics, the structure and requirements for skills on the labor market can be significantly altered during this time. The lack of an adequate public policy and the inactivity of commercial organizations leads to the emergence on the labor market of young professionals who do not have a requested specialization, or to the emergence of too many specialists (oversupply). The modern Ukrainian labor market is defined by a large number of employees who are active not in accordance to their occupation. Thus, we witness the driving force of innovation development to provided only with 3% of needed experts, while the „life sciences” are provided with 35% of experts (IT sector). Returning to the trends of labor migration outlined at the beginning of the article, we can conclude that the Ukrainian economy has a weak potential for the 4.0 Industry development. Thus, it is necessary for both the state and the business to face the challenges of the 4th Industrial Revolution (Україна 2030, 2017, p. 136).

Understanding the nature of the global economy processes which are related to the 4th Industrial Revolution, we offer considering two options while solving these problems. First, in case of a deep differentiation of countries based on ownership of innovative technologies, there exist two alternatives for countries with a low level of technological development. The first one is related to the closed nature of labor markets, and the second one – to its openness and flexibility. In both cases, the labor market will be defined by a high unemployment rate. However, in the first case, the unemployment problems will be exacerbated by the domestic economy and financial sphere problems within the country; in the second case, the state may become a donor of „cheap” labor force, especially of unattractive occupations. Consequently, in the first case, the state and business will have to solve all problems of the labor market on their own; in the second case, we will be able to observe a „disposal” of redundant labor force.

Secondly, a normal distribution of countries based on ownership of innovative technologies and openness to the labor market along with the above mentioned alternatives to labor market regulation, the labor market processes will have peak periods of „problems”

and „quietness”. Having in mind that the labor market is closed, the reorientation of staff towards acquiring new skills (training, postgraduate studies) will present a period of imbalances. However, in the future, the labor market tends to become more balanced. In case of open labor markets, there should be no significant problems for the labor force on the market. One can assume that on other equal conditions (the establishment of a housing market, the development of infrastructure, etc.), the open labor markets will become risk minimizing mechanisms when faced with any challenges of the 4th Industrial Revolution.

However, the most likely scenario is that of most labor markets to be closed; thus, in 10-20 years, clearly identifiable regions with labor force defined by a set of hard and soft skills will be appearing. Based on this hypothesis, the negative risks of the 4th Industrial Revolution can only be minimized by means of a close cooperation between state and business. The mechanisms of public-private partnership are to be accepted in this case. We believe that the joint state and the business must adapt the educational system to the needs of a more dynamic and globalized labor market. To accomplish this, we need to reconsider the education programs of future professionals by focusing on the development of a coherent personality which is ready to work in the face of dynamic systems and unsustainable trends. Moreover, it is also crucial to adapt the labor and fiscal legislation to the requirements of the global market without compromising the national interests of Ukraine.

CONCLUSIONS

The changes driven by the 4th Industrial Revolution will have a great impact on the economics of all the countries for a long time being. How quickly the state can adapt to the new realities defines the stability of its economy and the possibility to attract other countries and peoples.

After analyzing the nature and depth of processes associated with the 4th Industrial Revolution, the authors came to the following conclusions:

1. It is important to distinguish between the notions, features and basic principles of „the 4th Industrial Revolution” and „the 4.0 Industry”. The first notion touches upon a drastic change in global technology. The content and nature of labor conditions are already being changed, which both is and will be a result of the 4th Industrial Revolution in the future. The second notion defines the organization of production and creation of value chains using IT-technologies, robotics, personification of consumer proposals based on „Big Data” processing, artificial intelligence, and focusing more on the use of intellectual and creative potential of employees.
2. The 4th Industrial Revolution has new demands towards labor; innovative labor emerges, which is interpreted by the authors as activities that have distinctive features related to the nature and content of labor. It results in a profound change of understanding the role and place of each individual in the socio-economic system and nature.

3. Depending on the economic development of the state on its national labor market, the 4th Industrial Revolution will be subject to new requirements towards employees. Furthermore, innovative labor will be in great demand in developed countries and countries with emerging economies. The impact of the 4th Industrial Revolution on the labor markets of countries with weak economic development (failed states) is underestimated; there, we see continued employment trends that do not correspond to the basic education received. This encourages labor migration and disrupts the potential for further development, which exacerbates inequality and poverty.
4. Dealing with the 4th Industrial Revolution challenges on the labor market is possible only by means of a close cooperation between state and business. Forecasts of technological development (foresights) require the establishment of such a state policy for training specialists that will be the driving force of the state's innovative development.

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