NEW APPROACH TO AN ASSESSMENT OF INFLUENCE OF THE FOURTH INDUSTRIAL REVOLUTION TECHNOLOGIES ON ECONOMY

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Abstract

Under the influence of scientific and technical progress there is an intensive transformation of all spheres of life of society. It is advisable to classify spheres of person professional activity by introduction of the fourth industrial revolution technologies depending on values of two criteria: structure and nature of professional activity. In process of emergence and development in the conditions of digitalization of new products, processes and business models there will be workplaces of new type. It will allow both workers, and the companies to take measures for professional retraining taking into account forecasts of emergence of new professions and change of requirements to the existing professions in advance.

The main components of the valuable content of the specified technologies are revealed: it is important to ensure reliability and safety of information; demand socially responsible approach at their application and an exit for the existing borders.

In paper the assessment of influence of the fourth industrial revolution technologies on economy on the basis of the following criteria will be made: penetration depth of the fourth industrial revolution technologies in economic activity, the speed of their distribution and the predicted coverage by 2025

Key words: innovations, fourth industrial revolution, digitalization, values of the fourth industrial revolution, efficiency

JEL Code: O33, O15, I25

Introduction

Now there is a formation of post-industrial economy (digital economy), new production factor – knowledge and information whose importance sharply increases in ensuring efficiency of economic activity was created (Huang, 2007). Recently availability of information increased, there is an accumulation of large volumes of information on versatile aspects of economic activity (Zhang & Yang, 2013).

Under the influence of scientific and technical progress there is an intensive transformation of all spheres of society life: economic, social, political and spiritual – essentially new opportunities open, and cardinally the way of the person life changes (Symeonidou, Bruneel & Autio, 2017).

Now everything is more distinctly shown a tendency of degradation of borders between technologies and human beings. Any more production of the robots similar on living beings or synthetic organisms isn't surprising. New modern technologies have potential becomes literally part of the person. They are already capable to influence perception of people of that reality in which they are significant. And it concerns not only that the person thinks of the world surrounding him, but also its specific actions on transformation of the existing reality. For example, modern technologies facilitate access to human body, they allow to integrate digital technologies into a human body; besides, they allow to operate production and distribution of production remotely; they are widely used in a services sector. It is obvious that, the metaphor of "cyborg" became almost our reality, it doesn't cause shock any more, and the person is already ready to emergence in the near future of surprising combinations of digital and analog forms of life which transforms the nature considerably.

Speed of penetration of the fourth industrial revolution technologies to all spheres of public life is very high, significant surpassing speed of distribution of the third industrial revolution technologies (Byun, Sung & Park, 2017). Therefore the problem of adaptation to all destructive consequences of introduction of the fourth industrial revolution technologies is particularly acute for society (Kergroach, 2017). One of the effective directions of achievement of such adaptation is formation of values of new technologies which have to allow to keep to the person of themselves and the habitat (Onetti, Zucchella, Jones & McDougall-Covin, 2012).

1 Automation dynamics of professional activity

Habitat of the person is intensively transformed from the middle of the last century, and the speed of this transformation steadily increases every year (Šikýř, 2015). The present stage of scientific and technical development is characterized by the high level of automation and digitalization of all production and management processes generating irreversible shifts in structure of labor market (Boyko, Sekerin & Šafránková, 2014). Robotization leads to replacement of the person labor with functioning of robots in many branches of a national economy (Šikýř & Šafránková, 2016).

In modern conditions there was a steady reduction tendency of availability of the economic benefits which are formed as a result of scientific and technical development, strengthening of a social inequality. Universal and comprehensive robotization won't bring material abundance, won't create surplus for the person free time. Development of industrial digital technologies will cause transformation of future labor market. In process of the increasing use of digital technologies at the solution of complex production challenges the probability of reduction of workplaces increases, requirements to the personnel change, there are new fields of activity caused by digital transformation. It is also necessary to note that now innovative technologies are much more destructive for labor market, than a past innovation.

In table 1 spheres of the person professional activity are classified by activity of introduction of the fourth industrial revolution technologies depending on values of two criteria: structure of professional activity problems (distinguish creative activity for which the unstructured or poorly structured tasks are characteristic, and routine activity for which the structured tasks are peculiar and which can be easily subjected to algorithmization) and nature of professional activity (it is accepted to distinguish physical and intellectual labor**).**

Tab. 1: Susceptibility of professional activity to introduction of the fourth industrial revolution technologies

<table>
<tr><td rowspan="2">Level of structure of problems of professional activity</td><td>Creative activity (unstructured tasks)</td><td>Safety (protection), - about 50% are automated

Services industry (nurses, waiters, etc.) – less than 25% are automated</td><td>doctors, engineers, creative professions about 25% are automated

Law – about 40% are automated

Education about 25% is automated</td></tr>
<tr><td>Routine activity (the structured tasks) is an algorithmization</td><td>Builders, workers of industrial production - more than 75% are automated</td><td>Younger office workers, sales agents, brokers, bank employees, technicians-draftsmen, clerks (bank online of the program, program for control of the prices, Avtodesk, programs of electronic document flow) – more than 60% are automated</td></tr>
<tr><td></td><td></td><td colspan="2">Nature of professional activity</td></tr>
<tr><td></td><td></td><td>the physical labor</td><td>the intellectual labor</td></tr>
</table>

Source: authors, (An industrial robotics in Russia: problems and prospects)

As appears from table 1 the high level of automation and digitalization is characteristic for routine physical and intellectual labor. Concerning creative activity it is necessary to tell that physical labor processes are more robotized, than intellectual. Every year the automation level of production and management processes in all spheres of public life increases. According to expert forecasts, difficult self-training algorithms will be able to enter arrangement among themselves, thus the facts of coordinated actions of systems of artificial intelligence practical can't be proved.

The report of the World economic forum says that by 2020, by the most modest estimates, robots will take 5 million workplaces (Keisner, Raffo & Wunsch-Vincent, 2016).

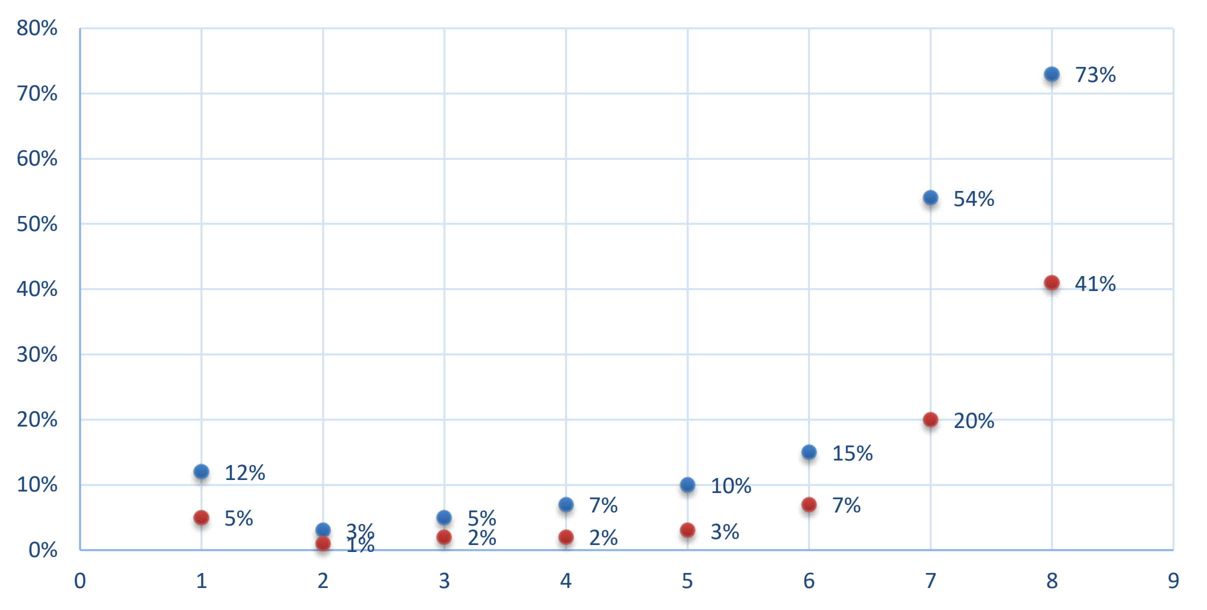
Now there is a technical capability almost completely to automate the content of labor of the following professions: loader, insurer, seamstress, database operator, broker, operator of call center, typographical employee, office secretary, cook, courier, accountant-auditor, cleaner, post employee.

At a current state of IT technologies robots can't seriously compete with people in the following areas which are united by ability quickly to react to new circumstances: school psychologists, caseworkers and supervisors (it is the first category – work with people in non-standard difficult situations); specialists in the analysis of efficiency of management systems, finance directors (the second category – the work connected with ability to apply provisions of fundamental sciences in real activity for example to apply mathematics to the solution of non-standard business challenges); allergists, immunologists, epidemiologists, microbiologists and other medical experts (the third category – the work with difficult cases of diseases demanding flexible approach to their treatment); engineers of different specialization and ecologists (the fourth category – professions which demand manipulation with physical space). Thus, people should master specialties with a high factor of unpredictability, only then they will have a competitive advantage in front of cars.

In process of emergence and development in the conditions of digitalization of production of new products, processes and business models there will be workplaces of new type.

Deficiency of knowledge and skills causes serious concern in many companies as this problem prevents to reach desired results from investments into digital technologies. Shortage of highly qualified specialists already disturbs or can prevent the company in the course of digital transformation of business (fig. 1).

Fig. 1: Deficiency of qualified personnel in the field of modern technologies



Specification:

1-the 3D-printer; 2 – blockchain; 3 – thrones; 4 - 4 virtual reality; 5 – augmented reality; 6 – robotics; 7 – artificial intelligence; 8 – Internet and things

Blue color: in what technologies is perspective to invest

Red color: the companies highly appreciate qualification of employees in this area

Source: authors, (The world research Digital IQ for 2017)

2 Valuable content of technologies of the fourth industrial revolution

Potential of the fourth industrial revolution technologies can make serious impact on all spheres of public life in the following directions:

- development of weapons of mass destruction on the basis of biotechnologies,
- expansion of use of environmentally friendly energy can become the reason of destabilization of geopolitical position of various countries,
- at broad use of nanomaterials their negative impact on environment and human health can be shown,
- development in the sphere of geoengineering can provoke irreversible changes in an ecosystem,
- development in the sphere of neurotechnologies can promote violations of freedom of the person,
- achievements in the sphere of the quantum calculations operating with qubits will undermine a basis of the protocols of safety used on the Internet.

Therefore the problem of adaptation to all destructive consequences of introduction of the fourth industrial revolution technologies is particularly acute for society. One of the effective directions of achievement of such adaptation is formation of values of new technologies which have to allow to keep an ecosystem.

Between technologies and values it is hard for communication to formulate. To raise a question of values without opinion of the certain person, their groups, the separate organization and their associations senselessly.

In relation to values of the fourth industrial revolution technologies as the important the following aspects act:

- in the modern digital world it is important to ensure reliability and safety of information therefore it is required to create new standard and legal climate as a priority for which information security from unauthorized use acts,

- awareness of scale of their influence in all aspects of human life that demands socially responsible approach to them,

- the specified technologies often demand freedom for an exit for the existing borders therefore it is important to provide their compliance of strategy and to the purposes of activity of economic subjects as it and will allow to turn belief into actions.

3 Assessment of influence of the fourth industrial revolution technologies on economy

It is possible to carry out an assessment of influence of the fourth industrial revolution technologies on economy on the basis of the following criteria: depth of penetration of the fourth industrial revolution technologies in economic activity, the speed of their distribution and the predicted coverage by 2025 (table 2).

Depth of penetration of digital technologies into economic activity of the companies can be determined as the specific weight of the actual use level of digital technologies at the enterprises from the demanded level. The most significant technologies are used and have the greatest depth of penetration into technological production. Thus depth of penetration of digital technologies into production isn't considerable. It makes from only 7% to 21%.

Tab. 2: Influence of technologies of the fourth industrial revolution on economy

Branch of economic activity	Depth of penetration, % (Russian companies)	Speed of distribution, % a year	The predicted coverage by 2025, %
Aerodynamics	11	11	75
Hydrodynamics	11	11	75
Durability	11	11	75
Heatmass exchange	11	10	70
Digital design	18	11	85
Management of business processes	18	12	90
Existence of industry solutions	18	9	75
Management of cooperation chains	18	13	95

Source: authors, (Schwab, 2016), (Utin, 2016)

Speed of distribution of the fourth industrial revolution technologies is a speed to which there are changes. It can be determined by an annual gain of an indicator of specific weight of the actual use level of digital technologies at the enterprises from the demanded level.

The predicted coverage of economic processes by technologies of the fourth industrial revolution can be measured by the specific weight of the predicted level of their use from total of the applied technologies.

According to forecasts of experts, the share of the automated processes in production and logistics will reach 95% by 2035, and 50–70% of present workplaces will cease to exist (Schwab Klaus, 2016).

Experts of the international consulting company McKinsey so estimated approximate effect from introduction "the Industries 4.0": labor productivity increases (by 45–55%), application of new technologies at the same time cuts down expenses on service of the equipment (for 10–40%) and an equipment idle time (for 30–50%), quality indicators increase (by 10–20%) and warehouse expenses decrease (by 20–50%). The term of a conclusion of new goods to the market decreases by 20–50%, the accuracy of forecasting of sales increases to the level of 85% and above (Utin, 2016).

Conclusion

Thus, in paper it is shown that the fourth industrial revolution technologies promote degradation of borders between technologies and human beings. The metaphor of "cyborg" became almost reality, it doesn't cause shock any more, and the person is ready to emergence in the near future of surprising combinations of digital and analog forms of life which transform the nature considerably. Spheres of the person professional activity are classified by activity of introduction of the fourth industrial revolution technologies depending on values of two criteria: structure of professional activity problems and nature of professional activity; it is shown that the high level of automation and digitalization is noted for routine activity. The directions in which technologies of the fourth industrial revolution can make serious transformational impacts on all spheres of public life are classified. The main components of the valuable content of the specified technologies are revealed. The assessment of influence of the fourth industrial revolution technologies on economy on the basis of the following criteria is made: depth of penetration of the fourth industrial revolution technologies in economic activity, the speed of their distribution and the predicted coverage by 2025.

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