

SOCIAL ASPECTS OF THE DEVELOPMENT OF THE CONCEPT "INDUSTRY 4.0": RISKS AND PROSPECTS FOR THE TRANSFORMATION OF HUMAN RESOURCES

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Abstract: *The formation and development of the concept "Industry 4: 0" is associated with significant changes in the structure and characteristics of human resources. It concerns the problems of the new structure of employment, the transformation of the educational system, the deepening of regional disparities. At the same time, the actions developed within the concept, including various programs, don't pay due attention to possible social risks and measures to reduce them.*

Keywords: HUMAN RESOURCES, CONCEPT OF "INDUSTRY 4:0", SOCIAL RISKS

1. Introduction

The objective tendencies of social development at present are linked with the "INDUSTRY 4:0" concept, which proposes a pivotal change in the manufacturing process of products and services as well as in the work force. It is no longer about innovation, but about essential transformations at the base of production, which change the traditional representations of the laws of economy, economic behavior, and educational and scientific systems.

The components of the "INDUSTRY 4:0" concept have relatively recently become the subject of active interest among the scientific community and practitioners; however, we can observe the phenomena and involvement processes of all spheres of social life transforming into something new.

If we analyze the publications, opinions, reports, and facts relating to this concept, then we can say that most of the attention is drawn to the technical aspects and emerging opportunities, the changes in production methods and in the methods and areas of interaction between producers and consumers, the economic resources, analysis of the technical prerequisites for realizing a new wave of innovation, the formation of new types of cities, and more.

At the same time, changes in production methods and economic activity cannot not lead to social transformations, the depth of which can perhaps be compared to the first industrial revolution. These transformations are certainly not always considered to be positive. The realization of the "INDUSTRY 4:0" concept relies on the objective preconditions, with its development focusing on achievements in technology, including informational. However, it is necessary to analyze the possible social consequences for society and identify the social risks in order to find mechanisms to reduce them. This has to do with problems of the new employment structure, transformation of educational system, and deepening of regional disparities.

The *objective* of the theoretical research is to look at possible changes in human resources and emerging social risks connected with the "INDUSTRY 4:0" concept being realized.

2. Overview of the formation of prerequisites for the "INDUSTRY 4:0" concept in relation to social risks.

The works dedicated to the "INDUSTRY 4:0" concept highlight the development of Internet of Things (IoT) which suggests significant changes in the activities of enterprises [1, 2, 3]. In traditional markets, enterprises represent a relatively autonomous socio-economic system in which business processes are organized in a particular way, and resources are consumed and transformed influence from the personnel. IoT suggests that various

participants in the market are joined in order to satisfy consumer demands and be flexible in responding to consumers' requests by using a single platform based on cloud services.

This changes the interactions within the enterprise and the role of the personnel. For traditional enterprises, it is the personnel who is a management resource, influencing the main kinds of resources, while an exchange of information takes place among people. The IoT system of management directly affects actuating devices in enterprises, and here the information and means of processing it are already a basic resource. In this sense, a number of processes in the future will be fully automated (according to specialists, examples of possible fields would be transport infrastructure and transport logistics). Accordingly, this will cause a reduction of personnel employed in similar fields as well as a change of the professional demands of those who remain.

The commercial Internet of Things, based on the principles of digital economy, makes it possible to combine resources (not only manufacturing and transportational but human as well) into "software-controlled", virtual resource pools, forming a shared economy in the industrial sphere, whereby the user is not provided with the devices themselves, but with the functions of the devices (the results of their being used), formed by joining and realizing cross cutting business processes and production processes.

Modern enterprises are now changing to a much larger degree under the influence of management technology, rather than production technology.

The consulting group J'son & Partners Consulting [4] notes the important tendencies of the modern economy that are related to the growth of IoT and to organizational and technological changes, such as:

- growth of access to data on the nature of equipment and product use (related to the growth of number of embedded devices) forms the possibility for new business models and services to develop;

- the economy's growth potential is ensured by the producers and internet-service providers themselves, who come to traditional spheres and transform them using cloud technology (taxi service, reservation of accommodation, etc);

- using new technology in the production chain and virtualizing the production functions create the possibility of producing a single product or a small series while taking into account the individual preferences of the consumer, thereby earning the manufacturer a profit;

- opportunities for sharing production infrastructure, thereby increasing the accessibility of resources for small businesses and widening the potential offers of various services.

Aside from the tendencies mentioned, the consulting group noted another one which directly impacts human resources:

"the functioning of various branches of economy will become continuously more complicated under the influence of technological development and will increasingly be carried out due to automatic decision making by machines themselves based on analyzing a large amount of data from connected devices, which will lead to a gradual reduction of the personnel's role, including qualified personnel. Quality professional education, including in engineering, as well as special educational programs for workers, and training will be required." [5] Therefore, the number of work places, including ones with qualification requirements, are expected to decrease in the future, thus forming a risk of unemployment.

When looking at the role of the service industry in a postindustrial economy, the majority of researchers noticed its role was in providing jobs and dampening the effect of reduction in the work force on industrial enterprises (for example, due to automation). However, when realizing the "INDUSTRY 4.0" concept, this dampening of social risks will not work. Moreover, the service industry itself will be at risk.

Russia is also under the influence of the new tendencies and processes related to the new technology paradigm. This is connected not only with the development of various local markets, but also with the formation of government programs.

We will highlight a number of points noted in literature and from internet sources.

The Internet of Things is actively developing in the transport sector. This includes not just remote monitoring systems. Nowadays, smart phones are very popular among users (around 50% of all mobile devices), and this has acted as a catalyst for the development of such services as Uber and YandexTaksi, while systems for monitoring road congestions on maps have been constructed [5].

The same tendencies exist in freight transport (logistics); the start ups GoCargo and iCanDrive are based on IoT. Specialists name such producers of remote vehicle tracking devices as Omnicom, "AutoGRAF Satellite Vehicle Tracking and Control System", GalileoSky, "Fort", Naviset, "Incotex", "Shtrih-TahoRUS", "Granit Navigator", M2M Cyber and others.

According to predictions, it will be the transport sector leading the new economy.

The company Ovum believes that transportation will significantly surpass the other economic sectors on income from the market of the Internet of Things [6].

This growth will be driven by the cost reduction of special equipment as well as the reduction of costs relating to implementing innovative solutions.

Accordingly, the employment structure in the transport sector will change (and is already changing).

According to the opinion of Machina Research and the company Nokia [7], income from the global market of the industrial Internet of Things will reach 484 billion euros by 2025, and the main sectors will become transportation, manufacturing, utilities, health care, and smart house application.

German scientists are considering ideas of a cyber platform, which would combine three types of networks: internet of people, internet of things, and internet of services (academy Acatech). It is noted that the development of "INDUSTRY 4.0" changes all social relationships, therefore problems in improving technology, technics, and production relations should be studied and solved by considering socio-cultural and demographic factors [8].

The consulting company IDC presented a new annual report, Russia Internet of Things Market 2017-2021, according to which expenses for the internet of things will reach over \$9 billion in Russia by 2021 (for comparison, data on this company show 2016

expenses at \$3.48 billion). Investments in equipment, software, services, and communications, which are involved in creating solutions for the internet of things in Russia, will grow on average 22% annually. Other factors highlighted for their contribution to these dynamics are: the interest and support from the government, the active digital transformation of companies, and the creation of partner systems for solution providers [9].

The "Digital Economy" program was adopted in Russia in July of 2017. The adoption of the program was due to a number of reasons, including Russia lagging behind in readiness for a digital economy, as noted in the program's text. It is pointed out that, according to a World Economic Forum's Global Information Technologies report, "The Russian Federation holds the 41st place in readiness for a digital economy at a significant distance from ten leading countries: Singapore, Finland, Sweden, Norway, the United States, the Netherlands, Switzerland, Great Britain, Luxembourg, and Japan. In terms of economic and innovative results for using digital economy, the Russian Federation comes 38th, lagging far behind leading countries like Finland, Switzerland, Sweden, Israel, Singapore, the Netherlands, the United States, Norway, Luxembourg, and Germany" [10].

World Economic Forum's Global Information Technologies report 2016 says «The Russian Federation remains in 41st place this year, as in 2015. The country places in the top third of the rankings for Readiness, Usage, and Impact, yet continues to be held back by a weak and deteriorating regulatory environment. As mobile and fixed Internet tariffs are very low and dropping further (10th place overall on affordability), individual usage continues to rise in almost every dimension, leaving Russia in 40th place in this category. However, the data suggest that infrastructure build-out is not keeping up with demand as Russia sees its availability of Internet bandwidth per user falling. Although Russia is close to the median in terms of business use overall, online sales to consumers (as opposed to other firms) are particularly strong (35th place). The positive impact of ICTs is felt both in the economic and the social dimensions, as reflected in rankings in the top third for both impact pillars» [11].

The goals of the program are: "to create a digital economy ecosystem in which digital data are a key factor in production in all spheres of social and economical activity and where effective cooperation is provided including across borders, in business, in the scientific and educational community, in government, and among citizens; to create the necessary and adequate conditions of an institutional and infrastructural nature, to eliminate existing obstacles and limits on creating and/or developing high-tech businesses..., to prevent new obstacles and limits from arising; to increase competition on the global market both in individual sectors as well as in the economy as a whole."

Three levels of digital economy are highlighted that in close cooperation affect the lives of citizens and society as a whole: economic markets and sectors; platforms and technology; an atmosphere which "creates conditions for developing platforms and technology and for the effective cooperation of subjects of the economic markets and sectors (spheres of activity), and which also covers regulation, information infrastructure, personnel, and information safety."

It is pointed out that the Program focuses on the two lower levels of digital economy, the directions being: forming a suitable environment (particularly personnel and education, and forming research skills); forming the basic infrastructure elements for digital technology (informational infrastructure, information safety) [10].

Thus, it is possible to acknowledge the influence digital technology has "on the lives of citizens and society as a whole." The health sector can be named as one of the branches of economy primarily affected by the transformations. Also presented in the course of the program are social aspects relating to changes in the system of education and personnel training. The following aims are

considered: "create key conditions for training the personnel of digital economy; improve the education system, which should provide a digital economy with competent personnel; labor market, which should be based on the demands of the digital economy; create a system of motivation to develop the necessary competencies and for personnel to take part in the development of the digital economy of Russia." Changes in the activities of educational organizations on all levels are envisaged on the "road map" of the program and propose the development of "digital competencies" and the formation of "a personal development trajectory."

The influence on human resources and society is considered in terms of its challenges and threats: "the problem of ensuring human rights in the digital world, including in the identification and preservation of digital user data, as well as the problem of ensuring the citizens' trust of the digital environment; the threats to individuals, business, and government, which are related to the tendencies of building complex hierarchical information and telecommunication systems that widely use virtualization, remote (cloud) data storage, as well as various communication technologies and terminals." [10].

However, possible social problems and risks are practically not given any attention in this government document (risks for the labor market, for the education system), as a result of which there are not even any indicators of the need to develop measures to mitigate possible negative phenomena.

One important problem, which is not only technical but social as well, is the ensurance of protection against unsanctioned access to user data. A lack of adequate protection can lead to threats to social safety increasing.

According to data from the company Avast, a research of smart devices in Russia showed that almost 24% of these devices were not protected against cyber attacks (for example, "nanny cams"), unsecured printers (27%), routers (almost 70%); this could lead to a violation of privacy and an increase in crimes. Unsecured devices can be used for connecting to other devices, for example, connected to a smart house, and can be used to control their function and can even cause harm [4]. Children can fall under this threat. The potential risks of using the My Friend Cayla dolls (an interactive toy that can hold a conversation with a child by using special devices hooked up to smart phones and tablets, as well as voice recognition technology), turned out to be so great, that the FBI (USA) were forced to warn the parents about the dangers of the innovative toy. Audio files recorded by the toy were collected by the corporation Nuance Communication, and a private database was made up of 30 million voice samples. In February of 2017, the federal network agency of Germany recognized the doll as covert spyware and obliged parents to get rid of the toy [12]. Even if the manufacturers of similar toys use the collected information to improve their performance, breaking into databases and leaking information is still possible (mass media provides the example of theft of data from a database which was collected by the manufacturer of the smart plush toys CloudPets) [13].

The recommendations given by the company Avast are to change passwords and software. However, a significant amount of users have little knowledge of the technical details and subtleties of devices. Accordingly, educating users is necessary in order to ensure an acceptable level of social safety.

It seems social risks relating to changes in the demands of the labor market and employment structure are much higher. According to company research from World Skills Russia and The Boston Consulting group (BCG), by 2025 the most in-demand workers in Russia will be those from the so-called "knowledge" category, who are capable of analytical work, improvising, independent solutions, and working in uncertain situations. As of now, approximately 17% of workers perform creative or analytical tasks (in European countries - 29-45%), around 50% are employed in predominantly routine work. 35% of workers are employed in

positions that do not require special training (the most common professions are: driver (7%), salesperson (6.8%), security guard (2%)). It is suggested that around 10 million people may be unemployed in Russia [14].

Personnel of low qualifications are at the most risk of losing their jobs (janitors, assistants, drivers, salespeople). Also at risk are workers who perform algorithmic work and technical work according to instructions (administrators in the service industry, workers of individual specialties, and workers from the service industry), as they can easily be replaced by machines, robots, and computer technology (according to Citibank's estimates, there will be around 57% of such professions in the next 10-15 years). The work of the mentioned groups is characterized by routines, standard tasks, decision making based on instructions, and physical labor.

It is worth noting that Russia is noticeably behind advanced countries when it comes to the level of robotics (1 commercial robot for every 10 thousand in 2017), therefore, problems of changes in employment will arise somewhat later than in other countries. However, active steps in the development of a digital economy can move this period noticeably closer. Workers who are let go due to this will be defined by quite low qualifications, while new work places for them may simply not be found. This could cause a growth in marginalized groups of society, a higher crime rate, and a lower quality and standard of living.

The international service provider Orange Business Services together with iKS-Consulting conducted a study of six Russian industry leaders of the enterprise market of the internet of things (IoT) - transport, finance, agriculture, retail, construction (smart building), and industry (August 2017). According to the analysts' estimates, traditional automation systems in the leading industries are used on average by a third of enterprises (CRM-, ERP- and SCM-systems, as well as automatic control systems; the M2M solutions, which appeared on the threshold of the transition to the internet of things, stand out separately) [15].

Researchers believe that the biggest growth in the implementation of the IoT-solutions is expected in retailing by 2020. In 2017, there were 1.4 million connected IoT devices in this sector; around 4 million are expected by 2020. Furthermore, this sector has seen a high level of implementation of CRM systems (23%) and SCM systems (12%), and a high level of competition which encourages the development of high technology, for example tracking goods using radio frequency tags (RFID), monitoring shoppers' movements using mobile devices based on technology that tracks the movement of buyers on store floors and using face recognition systems. This will change the requirements for personnel employed in retailing in the future. If today's trade sector successfully absorbs workers who have been let go, then the situation may change in the future.

S. Yezyk, general director of "Center 2m" notes that the transport sector is showing interest in IoT solutions, and the number of participants in information exchange is increasing. Thus, a "connected" car can provide information to insurance and leasing companies and the municipality, and processing this data makes it possible to predict malfunctions and recommend methods to fix them. [16].

In the Russian IoT market, pilot projects are being developed and introduced, technology is being tested, and completed industry solutions are being replicated. This allows us to conclude that the potential social risks will keep growing.

Incentives and barriers in the path of IoT development in Russia have been analyzed in the research from PwC [17]. In particular, the researchers noticed a limit on the side of consumer demand, namely the low income level. Thus, according to official statistics, the poverty level (population with an average income lower than the subsistence level) on average makes up about 13% of Russia (the subsistence level being 10,329 rub. – around 150 euro). This must also be taken into account, since there is a risk of

excluding a large portion of the population from the consumption of modern technology, and this can lower their standard of living even more. On the other hand, this portion of the population often performs unskilled work and could lose it with the launch of an industrial revolution, and effective demand will decrease even more. In other words, consumers will not have the means to buy smart things.

At the same time, the Russian consumer market of smart things has a particular specificity (for example, purchasing expensive mobile devices on credit, saving for months to buy a desired gadget, etc.). Thus, the proportion of iPhones in the smart phone market in Russia continues to grow and makes up more than 10% of sales in natural numbers.

Specialists have named the following as other social factors constraining the development of IoT: lack of specialists (inconsistency of the education system with future tasks), and inadequate knowledge and skills in working with smart devices.

It is worth noting the significant social effect that IoT technology can have for the health sector where micro and nanosensors will help improve the quality and accuracy of diagnostics.

IoT technology will have a multiplicative effect on the economy sectors due to an increase in workforce productivity and a reduction in costs. Accordingly, unemployment will increase. At the same time, not all those who will have lost their jobs will be able to learn the necessary professions, since changing from routine activities to creative ones is very difficult, especially for those with a long work history.

3. Solution of the examined problem

When considering the tendencies in the development of a new economy and the potential risks that may arise, it is necessary to provide social dampers and preventive measures to reduce risks.

A solution to part of the social problems can be linked to global changes in taxation principles, creating special social funds formed at the expense of super profits of companies (leaders of the new industrial revolution) or with taxation on robots. This idea was already put forward during an interview on the American internet portal Quartz by the founder of the Microsoft corporation, Bill Gates, who thought that due to the ubiquitous replacement of human labor by machines and robots, the work of the latter should also be taxed. He believes that employees pay taxes into a social insurance fund and personal income tax, so if the job of a worker has been replaced by a robot, this amount of taxes should be left. The created monetary funds could be used to pay social obligations for the elderly, unemployed, and large families. This would only be possible with state coercion, as employers will not make such deductions voluntarily. However, the European Parliament rejected the initiative to tax robot labor; according to the head of the European sector on digital economy Andrus Ansip, taxing the results of progress will lead to the technological lag of the European Union [18].

The problem of social risks in a new economy is recognized by the International Bar Association (IBA). According to research conducted by the association, around a third of people could lose their jobs due to the use of new technology. Therefore, it is necessary to change the labor legislation and new approaches to the right to work, since existing laws will not be capable of protecting people against the new reality. Gerlind Wisskirchen, IBA GEI Vice Chair for Multinationals and coordinator of the report, commented: «Certainly, technological revolution is not new, but in past times it has been gradual. What is new about the present revolution is the alacrity with which change is occurring, and the broadness of impact being brought about by AI and robotics. Jobs at all levels in society presently undertaken by humans are at risk of being reassigned to robots or AI, and the legislation once in place to

protect the rights of human workers may be no longer be fit for its purpose, in some cases» [19].

In the opinion of the association, governments must think about which jobs will be left to people and which jobs can be given to robots. It is worth providing job quotas for people. They also suggest introducing the special label "Made by human". Mechanical labor is not the only area shrouded by the threat. Lawyers also support the idea of a robot tax.

We should also highlight the problem of social adaptation to a digital economy, particularly, as concerns the need for continuous professional development and the development of new skills in the digital field. Experience in implementing internet technologies in the activities of various social organizations in Russia shows a high level of momentum, especially in provincial regions. One frequently noticed situation is where an interactive space is created formally (to meet law requirements, standards, etc.), but fails to work in reality. This can be concluded, for example, by analyzing the websites of many provincial houses of culture, primary schools in towns, passport offices, etc., even though the introduced technology is fairly simple. Thereby, a regional inequality between the central and provincial regions is formed.

Overcoming the risks of social security in connection with the use of innovative devices contributes to the growth of digital literacy among the population. This problem is consistently included in the Russian government program of digital economy.

The development of a new industrial revolution leads to a new social stratification. Expanding access to data and new solutions helps eliminate barriers for business and this provides new opportunities for a portion of the population. For those who are unable to adapt to the new challenges, a reduced salary, higher chance of unemployment, a lack of benefits, and a loss of economic status will become their new reality. At the same time, the funds for reducing social risks using traditional methods (taxes, insurance premiums) will be scarce.

The increasing inequality between various countries and regions can be cited as a global social risk. For those governments which are developing the IoT concept, the result is a strengthening of their position in the global system of division of labor and, as a result, the growth in the amount of quality jobs and the general growth of quality of life in these countries. Reducing the demand for low-skilled workers leads to a change in migratory behavior; however, those who have already come to a country, will probably create new social problems (employment, benefits, etc.). Poor countries practically lose the chance of a normal existence, since they will not even be able to supply human resources in the future. Therefore, it is necessary to think about global funds for social assistance, since the risks of social security will increase in this case.

4. Results and discussion

The examined social risks certainly do not cover all the possible negative social consequences and emerging issues. Experts also point out issues of work hours and issues of responsibility for decisions. The question arises, where does the responsibility of a human, robot, and automated decision making system start and stop? This is already relevant for such sectors like transport, where driverless vehicles are becoming more widespread. Another problem is the social responsibility for the work of technically complex systems (cost of error).

5. Conclusion

The development of the "INDUSTRY 4:0" concept carries with it great technical opportunities, including the growth of all economic indicators and improvement of the quality of consumption.

At the same time, the social consequences of a new industrial revolution are ambiguous, and a whole range of emerging social risks can be highlighted.

The most significant social risks are:

- social risks of realizing the newest technological solutions: social safety of device users, protection from criminal actions;

- social risks of deep changes in the labor market: inconsistency of labor legislation with ongoing changes, risk of unemployment and deepening inequality, risk of reduced income;

- social risks of inconsistency of activities of educational institutions (including teachers) with the demands of the new labor market;

- social risks of lack of financial resources for helping the unemployed, for retraining, etc. (including as a result of reduction of tax revenue on personal income and contributions to social insurance funds);

- social risks of a new regional inequality forming, due to international competition, including the fact that human resources of some countries will be unclaimed in the new economy; the same competition could appear within a country as well, between regions and between the central and provincial areas;

- risks of social exclusion of people who are unable to master digital competencies and provide flexibility in professional activities.

Possible courses of action to reduce the potential social risks are:

- global change of taxation principles relating to the creation of special social funds formed at the expense of super profits of companies (the leaders of the new industrial revolution) or with taxation of robots;

- significant changes in international and national labor legislation focused on protecting human labor against robot labor (a job quota, special labels on products, etc.);

- development of measures aimed at social adaptation to a digital economy, increasing digital literacy.

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