OCCUPATIONAL SAFETY AND HEALTH IN DIGITAL ECONOMY: CHALLENGES FOR GOVERNMENT REGULATION

Eugenia V. Nekhoda
Tomsk state university, Russia
sheyna@sibmail.com

Tatiana V. Kuklina
Tomsk state university, Russia
tyarm@mail.ru

ABSTRACT
Economic transformation has a strong impact on the labor market. New forms of employment are emerging and the processes and functions of employees are becoming more complex. This leads to the new types of occupational risks. Unfortunately, the existing model of government regulation of occupational safety doesn`t meet these modern challenges. We analyze the impact of the digital economy on occupational risks. We also describe foreign experience in modernizing government regulation occupational safety in the digital economy and offer solutions for reforming the Russian system.
Keywords: *Digital economy, Economy on demand, Occupational risks, Occupational safety and health*

1. INTRODUCTION

The system of occupational safety and health (OSH) was the result of industrialization, which created a need for labor and provided people with work, but created poor working conditions, resulting in many cases of industrial injuries and occupational diseases. OSH has improved safety at work resulting in reduced industrial injuries. But today there is an active change in business processes and business models. Technologization and robotization of production processes on the one hand reduces the risk of injury, and on the other hand, the intensification and intellectualization of labor carries new occupational risks that worsen the quality of life and health of employees. New forms of employment, such as on-demand employment, are a black box for national labor laws and the national occupational safety and health (OSH) system. Among Russian researchers, Prokopenko L. V., Denisov E. I., Roik, Boyko, and others were engaged in the problem of OSH in the digital economy. However, this topic is not well researched in Russia, while abroad this area is quite popular in security science. Problems of OSH in the new economic environment were concerned in the year after the publication of the book by Klaus Schwab "the Fourth industrial revolution", which focuses on aging professions and replacing them with robots, while the previous work will be replaced by Internet platforms. The changing nature of production associated with the implementation of innovative technologies, forcing you to change jobs, job functions, creates new and emerging risks along with the traditional [50, 51] international labour organization indicates the need for research on new and emerging risks to develop recommendations to Governments on policies for the protection of labor [28]. Some authors devote their research to changing occupational risks associated with new types of employment [6, 11, 12, 22, 26, 36, 53]. All researchers agree that the innovative economy reduces the risk of injury in production, but generates new risks that lead to occupational diseases. Taking into account the strong impact of psychoemotional factors on the health of employees a number of researchers are studying the mental health of modern workers and improving the level of OSH to preserve mental health [15, 16, 17, 29, 49, 52]. Also, we found several studies on OSH in the conditions of the fourth industrial revolution.

Thus, J. Min, S. Lee, and J. Song write about the need to develop new government programs in the field of OSH and compensation in the context of widespread non-standard employment and robotization and a shift in emphasis from an employer-centric to a public health approach, as set out in the WHO's Health and Safety Convention [30] A. Badria, B. Boudreau-Trudelc , A. Saâdeddine Souissid study the transformation of occupational risks and come to the conclusion that national occupational safety systems are inflexible and need to be modernized as soon as possible based on studies of the impact of non-standard employment on occupational risks [8].

2. RESULTS

Using the methodology of literature analysis, we tried to determine the ways to improve the Russian labor protection system. To do this, we have taken several steps. At the first step, trends in the labor market and the landscape of occupational risks were identified. In the second step, we studied the foreign experience of transforming OSH. At the third step, we proposed recommendations for changing the state policy in the OSH.

2.1. The impact of the digital economy on global employment

The digital economy is often associated with the fourth industrial revolution, which was described in detail by Klaus Schwab in his report at the world economic forum in 2016. In his work "the Fourth industrial revolution", Klaus Schwab describes possible changes in the labor market due to the emergence of qualitatively new forms of organization and business conduct from the point of view of social and labor relations [50]. From the point of view of the development of the organization of industrial production, it is customary to distinguish four main milestones [8]:

1) The first industrial revolution (second half of the 18th – end of the 19th century) the transition from skilled artisans producing goods by hand to workers using machines powered by a water wheel or steam engine. In other words, there was a mechanization of production.
2) The second industrial revolution (late 19th – early 20th centuries) - the beginning of mass production due to the replacement of steam energy with electrical energy and the invention of the conveyor.
3) Third industrial revolution (second half of the 20th century) - discoveries in automation and computerization brought global changes to the production process, including improved accuracy and speed through computer-based calculus and control systems
4) The fourth industrial revolution (the beginning of the 21st century) is usually described by specifying key technologies that have already left the R&d sphere. These technologies include [51]:
   - Big data and machine learning
   - Internet of things
   - Virtual and augmented reality
   - 3D printing
   - Printed electronics
   - Quantum computation
   - Blockchain

The world has overcome differences in time and space with the development of information and communication technologies, which have become a single economic system. Social networks have changed the way people communicate forever. In the future, operating technologies or cyber-physical system devices will track, coordinate, and integrate information in real time. Operating technologies will lead to a Hyper-connected society: with human-machine, machine-machine, and human–human contacts [5].

If human labor is replaced by machines, the labor market will face the challenges of a new industrial revolution [7]. As technology develops, productivity increases and new jobs are created. According to the US Department of labor, from 1960 to 2014, the number of workers in American factories decreased by two-thirds, but labor productivity increased sharply [8]. In addition, the average hourly wage increased by 85% from 1973 to 2014 [50], and new jobs were created in new industries. During the third industrial revolution, the labor force moved from the manufacturing sector to the service sector. In the digital economy, it is not the number of people employed that matters, but the qualifications and jobs that an employee can perform. According to the WOH report, robots will destroy more than 75 million jobs in the world in the near future, although they will create 133 million new ones.[51]

2.2. Changing occupational risks in the digital economy

Modern labor protection systems in the world were built in the industrial era and do not change, despite the transformation of the economy and the industrial landscape. Occupational accident insurance systems are based on the degree of occupational risk and the likelihood of injury at work or occupational illness due to the performance of professional functions. But the classification of occupational risks is also adequate for the industrial age and does not meet the challenges of modern times. The international labour organization recognizes that safety training, culture, practices, supervision and enforcement must be adapted to the new economy [28]. In the on-demand economy employment is equated to self-employment, which means that such people are excluded from legislation to protect injured workers at work [33]. In the legislation on labor protection in most countries, it is customary to refer to an employee only those who work on a permanent basis, with an established workplace and an employment contract [9]. Because of this, employers are not required to provide social security, including pensions, insurance, paid leave, maternity leave, and sick leave [45]. If a person employed in the on- demand economy has an accident, they will not be entitled to compensation and other benefits in accordance with the legislation on the protection of employees from industrial accidents. In addition, for independent workers, unions are difficult to form. In platform companies, one independent employee registers on multiple platforms and provides labor individually in accordance with the needs of the consumer, so there is little sense of belonging to the workplace and little meaning out of solidarity with colleagues. Unstable employment tends to have a negative impact they affect the state of health [34], as it causes psychological and physical causes health risks such as low mental health, dissatisfaction with physical health, anxiety, or high blood pressure. The growth of gigonomy has brought new, previously unknown occupational risks. Trade unions, government regulatory authorities in countries such as Australia, France, Canada, and some States of America (e.g.Florida) today focus their efforts on adapting current labor and compensation legislation to new forms of employment [8]. In our opinion, there are the following problems of workplace safety in the conditions of gigonomy:

1) Some companies that practice new forms of employment operate in areas that are highly risky in terms of occupational risks, such as passenger transport. The risk of injury to an employee of this company who is not employed in a traditional way remains as high as if they were on the organization's staff.
2) Many companies use temporary workers who may not have experience in a particular field. In the absence of proper recruitment and retraining, these workers may not have the knowledge and skills necessary to perform their jobs adequately. Safety training may be necessary so that these employees can perform their duties with the least degree of professional risk. Similarly, given their independent nature of employment, these workers may need personal protective equipment or other traditional workplace protection designed to reduce workplace risk.

3) The Absence of a fixed workplace and gaps in legislation lead to the fact that the injured employee can not get under the insurance program for industrial accidents and occupational diseases only because the organization's management will not provide documentation of the work injury.
4) Gigonomy, characterized by flexibility and independence, tends to attract young workers. Young employees often have less work experience and less experience in the field of occupational safety. These employees may be at greater risk of security threats. Worse, young workers may have an unwarranted sense of invincibility because it is associated with workplace hazards. In the absence of a safety culture, these workers may be more likely to be injured or sick.
5) In the on-demand economy, stress also plays an increasing role as a production risk due to the unstable position of the employed. First, the on-demand economy does not guarantee a person full employment, but only when there is a request for their services. Second, the on-demand economy does not provide stable earnings. Earnings only appear if the employed person is performing work. In such conditions, the employed are stressed by instability [30].

The international labour organization also focuses on psychoemotional risk and stress [28]. From the point of view of experts, the psychoemotional factor is more serious and relevant in the digital economy than the industrial factor due to the increase in the manufacturability of production. Reduced stability, increased intensification of labor functions are factors of stress disorders. In the short term, stress causes decreased performance, apathy, and depression. In the long term, it can have consequences on the musculoskeletal system, the occurrence of hypertension, peptic ulcer disease, cardiovascular diseases, etc. Studies conducted in Europe and other developed countries show that stress is a factor in 50% to 60% of all lost working days [60]. Stress is the second most frequently reported occupational disease in Europe and covers about 22% of the employed [60]. Thus, despite the positive impact of the digital economy on reducing workplace injuries and improving work comfort, new forms of employment and new elements in the production process, such as robotics, have a negative impact on human health (table 1).

Element of the digital economy	Advantages for OSH	Related occupational risks
Robotics and artificial intelligence	reducing the likelihood of industrial injuries due to the replacement of human labor with robotic work on harmful, dangerous objects	- risk of injury due to direct contact with robots in the event of a program failure; - increased mental stress: reduced human communication, fear of replacing robots increases anxiety, depression, etc.
Telework (home work)	Reducing the likelihood of injury at the workplace or on the way to work	Psychoemotional and ergonomic risks are increasing. Increased risk of acquiring occupational diseases associated with disorders of the musculoskeletal system, visual organs due to uncontrolled compliance with the employee's work and rest regime.
On-demand economy	-	High psychoemotional risk factor; Uncertainty of the individual's position from the point of view of legislation in the presence of the same occupational risks as in traditional employment

Table 1: Elements of the digital economy and occupational risks

2.3. Changing approaches to occupational health management at the present stage

Despite the potential for employment created by online platforms new challenges arise for the state regulation of labor protection and health of employees. Regulation of online platforms is difficult due to their rapidly changing activities and the use of innovative methods of work.as a result, traditional tools of state regulation cannot be applied to online platforms.

The application of traditional labor protection rules is difficult due to the high independence of the employee on online platforms, since he is not tied to the workplace and work schedule.A further challenge is that social dialogue is often not available as a regulatory alternative, as the traits of online platform work (individuality, turn-over, varied working patters, competitive mechanisms) are not conducive to unionisation. The online platform reduces the responsibility of the employer in providing labor protection [38, 42, 53]. Due to the fact that the business owner is not clear, the subject who is responsible for the life and health of the employee is also not relevant. Thus, in order to expand the scope of service of the OSH and compensation, the definition of "employer responsibility" and "employee" needs to be revised. In response to these challenges, there are several options for state regulation of labor protection [25]. The first approach is to apply the old rules to the new conditions. The first approach is to 'just' apply the existing rules to the online platform, which entail an individual definition whether an employee of an online platform is an employee, self-employed, or "something" in between. Depending on the (flexibility) of the test used to determine employment status, this may already include many employees of the online platform are in the employee category or in the intermediate category, which means this (most) employment and OSH rules will apply — at least legally. The second approach is as follows take concrete measures to reduce the number of people who will be considered "self-employed" by adding an intermediate category of "independent employee" or rebuttable presumption employment. The third approach is to separate the application of existing rules from employment, thus, the rules of employment and labor protection also apply to self-employed persons. The fourth approach is as follows provide specific (OSH and/or other) protection for employees of the online platform, regardless of whether their employment status. Developed countries are already involved in the process of researching the specifics of labor protection in the on-demand economy, and some countries have already made changes to legislation to guarantee protection for people working in online platforms. The analysis of foreign experience shows that at the first stage, countries conducted a comprehensive study of the gigonomics, its scale, and its impact on the national labor market. These reports can be found in France, Australia, Germany, Belgium, the Netherlands, the European Union, the United States, and the United Kingdom. At the second stage, lawmakers tried to determine the position of people employed in online platforms in the labor legislation. As mentioned earlier, it is the uncertainty of the legal status of non-standard employees that creates problems in the field of labor protection and social insurance. For example, in France, independent employees of online platforms are citizens who are economically and technically dependent on the online platform. In France, work on the modernization of legislation began in 2015 with a comprehensive survey of the labor market of online platforms. The French law on labor protection was supplemented with the following positions [25]:

- independent employees have the right to be insured against accidents and the online platform is responsible for this;
- that these employees are equally entitled to continuous professional safety training, for which the online platform is responsible;
- that they have the right to form a trade Union, be a member of a trade union and have the union represent their interests and have the right to take collective action in defense of their interests. Separately, because of abuse, such collective actions cannot give rise to contractual liability, nor can they give rise to it.
- they can also not be used as a reason to terminate their connection with the platform for such actions, the platform is punished in a different way.

In addition, a specific discussion was held in France on the implications of digital technologies in the field of occupational safety.

One of the priorities of the action plan in the field of labor protection 2016-2020 is about fighting emerging risks, including those related to digital technologies. It offers the following framework for action to combat the use of digital tools [25]:

- raising awareness of the need for companies to integrate into their risk assessment;
- issues related to digitalization (workload, configuration of digital tools, information load, etc.) and develop training of relevant actors in companies in this regard;
- the creation of shared workplaces and shared spaces for telerobotics;
- addressing these issues at the European level, in particular in the context of possible adaptation of the display screen Directive.

In addition to changing the approach to determining employment in developed countries, the approach to accounting for statistical indicators in the field of occupational health is also changing. So, if in the industrial era attention was paid to the number of accidents at work, now the statistics of occupational diseases come to the fore. In some European countries, close attention is paid to the accounting of mental disorders and diseases, given the strong influence of stress as a factor of occupational risk. In the UK, the total number of cases of work-related stress, depression or anxiety in 2016-18 was 488,000, with a prevalence rate of 1510 per 100,000 workers. The number of new cases is 224,000, and the incidence is 690 per 100,000; the number and rate have generally remained the same for more than a decade. The number of lost working days is 11.7 million days, with an average of 23.9 days per case. In 2016-18, stress accounted for 37% of all work-related illnesses and 45% of all work days lost for health reasons [26]. In the United States, according to the American productivity audit in 2016, workers with depression cost employers more than three times as much for lost productivity as they did for all other diseases. The journal of the American medical Association in 2015 reported that the loss of working time due to depressive illness is 44 billion dollars per year. According to the Canadian Association of mental health, for every employee cured of depression, the employer saves from 5 to 10 thousand dollars a year on the cost of medication, disability and replacement at work [16]. In France, with an active population of 23.5 million people, 1-1. 4% suffer from diseases related to occupational stress [25]. The cost of stress at work is 830-1656 million euros per year, i.e. 10-20% of the cost of compensation for injuries and occupational diseases of the social insurance system. According to who, France ranks 3rd in the world among countries in terms of the number of workers with depression. Stress affects one in four employees out of 10; 71% of organizations Express concern about the increase in stress, but 65% have not yet taken measures to combat it [42]. According to scientists, depression is the second cause of disability in the world, and more than 4% of the world's population has such a diagnosis [19]. However, when constant and continuous jobs are scarce, and people have more than one job by their needs, it was hard to assess risk of jobs. Furthermore, in this situation, current industrial accident compensation system cannot protect independent workers. Therefore, this should also be changed from an employer-centered approach to a public-health approach [60].

2.4. Recommendations for changing the state policy in the field of labor protection in the Russian Federation

Currently, Russia has a reactive model of occupational safety management, which was formed in the late 90s – early 2000s. It is based on several principles: it is a strict state control and reaction to an incident that has already occurred based on the results of its investigation. For almost two decades, this system has worked effectively and achieved good results. Over the past 12 years, the number of accidents with serious consequences at work in Russia has more than halved: from 13.7 thousand in 2007 to just under 6 thousand in 2018. The number of fatal injuries has tripled over the same period. However, now the potential of the system is exhausted, the Ministry of labor and social protection of the Russian Federation recognizes.

What worked in the industrial economy does not cope with the challenges of the digital age. Given the speed of changes in technology and the nature of work, the model must be flexible and able to adapt to changing conditions. It is necessary to move from responding to accidents at work and occupational diseases that have already occurred to prevention, effective prevention of the causes of their occurrence. This should not just be a declarative call, it should be spelled out in detail. In other words, it is necessary to create an advanced modernized model of labor protection management. According to the ILO, 2.34 million people die each year from work-related accidents and diseases. Most of them – 2.02 million-die from occupational diseases. Of the 6,300 daily work-related fatalities, 5,500 occur due to occupational diseases. The total number of non-fatal occupational diseases is 160 million per year [13, 23]. It is clear that the death rate from occupational diseases is much higher than from accidents, but in Russia it is not registered or analyzed. This can be partly explained by the fact that Russia, having ratified the ILO Convention 160 "on labour statistics" of 1985, did not ratify its article 14 on statistics of accidents and occupational diseases. Article 2 of the Convention is also not implemented:"in developing or revising the concepts, definitions and methodology used in the collection, processing and publication of statistical data provided for in this Convention, member States shall take into account the most recent standards and guidelines established under the auspices of the International labour organization". This applies terminology and guidelines for example, the ILO definition of occupational diseases as diseases, "due to risk factors associated with work"; it is broader acting within the law 125-FZ and the spirit of article 209 of the labour code on vocational risks. It is necessary to change the outdated paradigm – "labor protection" and form a new paradigm- "health and safety at work" - with a model that can adapt to modern conditions. The main directions can be: - creation of workers 'health protection services based on the ratification of the Convention 161" on occupational health services " (new amended name: "About employee health services»); - ratification in Convention 160 of article 14 on statistics of accidents and occupational diseases and adoption of the international terminology of the ILO [24]: "Occupational disease – a disease developed as a result of exposure to risk factors caused by work", as well as the terms "incident" and "dangerous incident" [24] and understanding of their medical consequences for somatic, mental and reproductive health; - legal recognition of the concept of who 1987 "work-related diseases" (eng. work-related diseases) and its Association with the letter and spirit of the ILO occupational diseases list 2010.

3. CONCLUSION

Digitalization of the economy is already a fait accompli. The new challenge of 2020 in the form of the COVID-19 Pandemic is likely to further accelerate the digitalization of workplaces, which will entail increasing problems in the field of worker safety. Research shows that the level of injuries among informal workers is higher than that of traditional workers, while the degree of protection and coverage by the labor protection system is minimal. Workers in the on-demand economy are exposed to both physical and psychosocial risks. Also, workers of the online platform is usually younger people who are more vulnerable from the point of view of a traumatism. Currently, most of the labor protection services are located in business divisions. However, as the employment relationship changes along with the FIR, divisions and responsibilities for managing employees exposed to harmful factors become unclear. Currently, OHS services in asbestos business units cannot take care of independent workers employed on a project-by-project basis. In other words, OHS services should be changed from an employer-centric to a public health approach, as set out in the WHO's Health and Safety Convention [60]. It is necessary to create a system for monitoring the appearance of new ones forms of labor protection issues, training of experts who will be responsible for changes OSH issues, as well as the adoption of new labour laws and social insurance systems in accordance with changes in working conditions.

Reducing the number of accidents and injuries among employees due to the technological and robotic nature of production, as well as the development of service activities, does not reduce the need for labor protection. Occupational injuries are replaced by occupational diseases, which must be taken into account in order to provide social protection for the employee. To cope with the emerging OHS issues in the fourth industrial revolution era, we need to establish new concepts of 'decent work'," and standardized regulations which apply to enterprises in each country, to develop public health as an OHS service, surveil emerging OHS events and networks among independent workers, and nurture experts to be responsible for new OHS issues.

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