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Transformation of Public Relations in The Conditions of Technological Revolutions: Technology and Innovation

Dmitry Kuteynikov, Osman Izhaev, Valerian Lebedev, Sergey Zenin

Abstract*: The impact of technologies, fundamental to industrial revolutions, on the development of legal approaches to the regulation of social relations changing during their widespread use, is considered in this article. It is shown that the well-known technological revolutions did not pass without leaving a trace and led to fundamental changes in public life. The economic and social factors that influenced the regulation of social relations are analyzed; the legal consequences of three technological revolutions are revealed. Theoretical and legal aspects of the formation of individual branches of legislation are studied. The thesis that the interaction between a person and the technologies (technical means) of the three industrial revolutions was limited to the unilateral mechanical use of these means according to the needs of society is proposed and substantiated. The current state of technological development suggests that the world has entered a new era. The impact on the social relations of artificial intelligence, robots, the Internet of things, advanced materials, additive production and multidimensional printing, bio- and neurotechnologies, virtual and augmented reality will only increase. These technologies will lead to new, different from all that was before, ways of human interaction with technical means. Three prospective ways of human interaction with the technologies of the fourth industrial revolution have been analyzed by the authors: coexistence (a technical tool is able to fully communicate with a person), relationships (a technical tool plays the role of an assistant in certain areas) and mergers (digital and mechanical elements are fully integrated into a biological subject). Some of the risks to society, possible with these methods of interaction, are described. The need to develop regulatory frameworks able to create conditions for the successful introduction of advanced technologies and minimize their negative consequences is justified.

***Index Terms*: artificial intelligence, cyber-physical systems, fourth technological revolution, legal regulation, robots.**

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***** Correspondence Author

Dmitry Kuteynikov*, Department of constitutional and municipal law, Kutafin Moscow State Law University, Moscow, Russian Federation.

Osman Izhaev, Legal department of the Moscow city election commission, Moscow, Russian Federation.

Valerian Lebedev, Department of constitutional and municipal law, Kutafin Moscow State Law University, Moscow, Russian Federation.

Sergey Zenin, Department of constitutional and municipal law, Kutafin Moscow State Law University, Moscow, Russian Federation; Department of theory of state and law, constitutional and administrative law of South-Ural state University (National Research University), Chelyabinsk, Russian Federation.

I. INTRODUCTION

The time being is characterized by the rapid development of digital technologies that provide a qualitatively new platform for the interaction of a person, society and the state. The active implementation of the technological potential accumulated over the past decades has become the reason for the transformation of the economic, social, cultural and political life spheres of society. The matter of technology impact on societal changes has a long tradition and an extensive research base in science fiction and the humanities. The approach, according to which the course of development of society is not totally subordinated to any one factor, is shared by the authors and generally accepted, while technological, economic, political and other determinisms are rejected. In the authors' opinion, the opinion that society is a complex matter, the development of which is influenced by many factors, is the most scientifically meaningful. The reduction of the evolution laws of society to the influence of individual factors, for example, the emergence of new technologies, is erroneous. At the same time, in the digital age, when the world is changing in a quite noticeable way due to various kinds of innovations, it is impossible to ignore the obviously important role of technology in the evolution of social relations. New computational capabilities, artificial intelligence, robots, the Internet of things, advanced materials, additive manufacturing and multidimensional printing, bio- and neurotechnologies, virtual and augmented reality are recent inventions. They have a huge number of applications in which they can positively affect the level of well-being of people. However, the negative consequences of their use are also quite obvious and frighten by the degree of their danger to the future of mankind. Under such circumstances, the study of the theoretical and legal aspects of the development of social relations in terms of technological revolutions seems to be a necessary and urgent task. This will allow forming a comprehensive understanding of the patterns of technology influence on the evolution of social relations.

II. LITERATURE REVIEW

Scientists have studied the topic transformation of Social Relations in the Context of Technological Revolutions, Castells, M. [1] consider the Rise of the Network Society.

Blackwell; object of study Allen, R.C. [2] became the British Industrial Revolution in Global Perspective (New Approaches to Economic and Social History); Hartwell, R.M. [3] investigated the Industrial Revolution and Economic Growth; Schwab, K., & Davis, N. [4] studied shaping the Fourth Industrial Revolution and other researchers developed this topic.

III. PROPOSED METHODOLOGY

A. General description

Limitation of the subject matter and definition of the methodological tools of research that are most relevant to its goals are required for achievement of specific scientific results. This article is devoted to identifying the correlation between the emergence of new technologies and changes in social relations, which, in turn, necessitated the creation of qualitatively new approaches to legal regulation. Therefore, it seems appropriate to analyze the history of technological revolutions and determine how they influenced social relations. From a methodological point of view, the authors will proceed from the fact that, with each revolution, technology, first of all, influenced the economic structure of society, which later influenced the social structure. As a result, in response to these phenomena, the law, as a regulator of social relations, with varying degrees of intensity, tried to adapt to current changes.

B. Algorithm

In conducting the study, a dialectic approach was used; general scientific and particular scientific methods of cognition and judgment were used, including:

- the method of analysis, through which the formation and development of technological revolutions and the process of their influence on social relations were speculatively divided into separate aspects (historical, economic, social and legal) and consistently studied;
- the method of synthesis which allowed gathering back the known parts of the process of the influence of technologies on social relations and study them as a whole, integrated and complex phenomenon;
- the induction method, in the use of which particular facts contributed to the establishment, separation, and formulation of theoretical positions and patterns of development of social relations in terms of technological revolutions, as well as the establishment of the sequence and interconnection of events, actions arising in practice, and their legal display;
- the deduction method that contributed to the formulation on the basis of general facts of particular conclusions and knowledge of the patterns and properties of the development of social relations under the influence of modern technologies;
- the method of system analysis, by means of which the transformation of social relations in the conditions of technological revolutions was studied as a set of its constituent elements, taking into account their structural interrelation, the latter was perceived as one of the criteria for identifying one or another part;
- the nomothetic approach, the use of which had allowed identifying common patterns and relationships, as well as putting forward assumptions about the further development and configuration of relevant phenomena in the group of historical, economic, social and legal phenomena included in the process of transformation of social relations, taking into account the current technological revolution.

The interdisciplinary nature of this work predetermined the use of not only general scientific but also specific scientific methods of jurisprudence:

- the formal legal method that allowed the study of legal phenomena and legal texts, their interpretation in a logical sequence using special legal terms and structures.
- the method of legal modeling, with the help of which the theoretical foundations of the construction of legal models of human interaction with modern technologies were studied.

C. Flow Chart

The study was carried out using certain algorithms of the study, through which the results were obtained, the algorithm of the study is presented in (Fig. 1. Research algorithm):

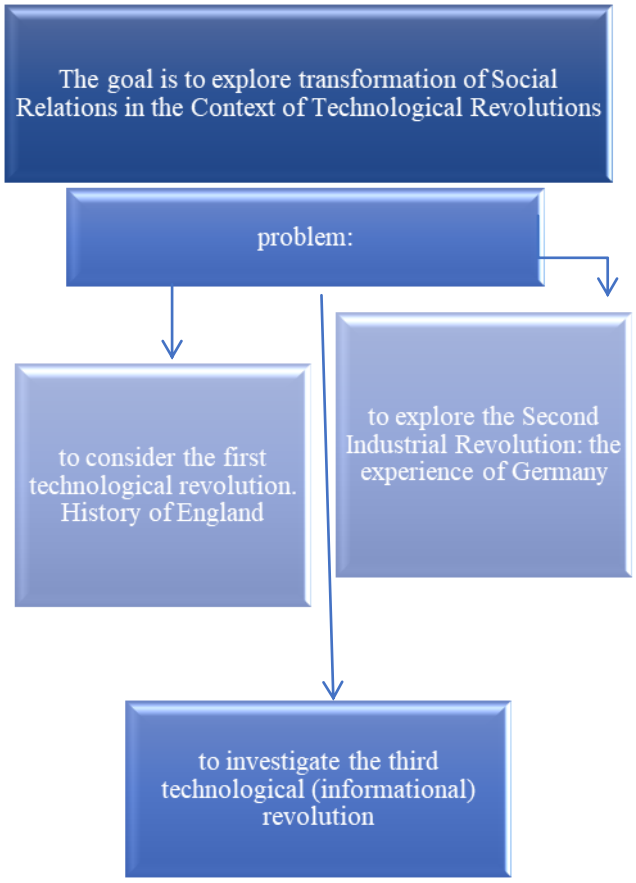

Fig. 1. Research algorithm

IV. RESULTS

The study of the process of formation and development of technological revolutions through the prism of changes in social relations and legal approaches aimed at reflecting the demands of an evolving society made it possible to formulate a number of conclusions:

1. As a result of the first technological revolution, mechanical machines took an important place in the production process. The integration of a person with a technical device (machine) made it possible to receive the greatest economic benefits from this. This led to the fact that the labor of the general population, which was dependent and knowingly deprived of rights, was used by the owners of capital to work on mechanical machines. The general increase in the standard of living of the population due to the introduction of technology occurred not due to a targeted state and legal policy, but contrary to it. The public authority, as can be seen by the example of England, initially chose the tactic of non-interference in the emerging social relations.

2. The inventions of the next technological revolution exacerbated the social consequences (both positive and negative) associated with the technologies of the first one. The increasing complexity of economic relations has led to an increase in the number of people belonging to the working class and being extremely dependent on property owners. At the same time, the trend towards an increase in the standard of living of the population remained. European countries, in particular, Germany, were forced to take a course on the socialization of politics and legislation.

3. Technologies of the second half of the 20th century led to the formation of information society. Digital technologies made it possible to instantly produce, process and transmit information. Communication between the person and the technical device was transferred to the digital platform; a new mediator appeared between them in the form of a new technology, which made it possible to automate partially certain processes.

4. All inventions created as a result of three technological revolutions were used by a person unilaterally as tools for increasing human productivity, transforming nature according to the needs of society, for people to interact with each other. Technical means were used for the accumulation of capital due to the integration of a person with a machine; in other words, both a person and a machine were considered as a single subject of production.

5. The achievements of the fourth industrial revolution lead to the emergence of unprecedented new ways of human interaction with technical means. They can potentially be divided into three categories. The first includes cases where a technical means is capable of being a full-fledged subject of social relations on a par with a person; such interaction can be called coexistence. The second method, involving the subordination of the actions of a technical means to the will of a person and the satisfaction of his or her individual needs in certain areas of activity, should be defined as the relationship of a person with a technical means. Finally, the third way of interaction is proposed to be called the merging of a person with a technical tool, since it means the association of a biological subject with separate digital and mechanical elements.

A. The first technological revolution. History of England

I

There is a consensus in the scientific community that the first technological revolution occurred in the territory of England in 1760-1830. A considerable number of studies are related to the explanation of this phenomenon and the identification of its causes. Such achievements as the invention of a steam engine, a cotton-spinning machine, as well as the beginning of iron production using coal coke and the development of communication lines [5], were the technological basis of the industrial revolution. The high labor cost and low energy cost [2] contributed to the expansion and widespread use of these inventions in England, which was a great incentive for entrepreneurs to search for the most technologically advanced ways to replace human labor. In other European countries, industrialization also took place, although it took place with a delay and was based on the experience of England [6].

Pre-industrial production was concentrated in small communities, within households whose members were usually related by kinship. Residents of these settlements satisfied almost all their needs independently; the distance between the producer and the consumer did not go beyond the framework of the respective settlements [7]. Factory production, the distinguishing feature of which was the replacement of manual labor with machine labor, made it possible to manufacture products in quantities never seen before. Moreover, the development of communications promoted the distribution of goods over long distances. This led to the complication of social relations associated with the production, distribution, and consumption of economic goods. The usual methods of production were modified; henceforth, the owners of large capitals concentrated hundreds of machine tools in their hands, installed them in isolated premises and started working there. In the 18th century, riots related to the struggle against the mass introduction of machines occurred quite often in England. Factory discipline, involving strictly scheduled work, was extremely unusual for the population. Moreover, given the high cost of labor, entrepreneurs went to tricks, massively using the labor of women and children, because the work on the machines did not require muscle strength, and their work was very cheap. They also could not counteract the oppression by property owners in an organized way. The working day was limited only to the physical exhaustion of children and could last 14-16 or even 18 hours. The supervisors, whose salary was formed depending on the time of the workshop, did not allow slowing down the work even for a minute [8]. In addition, there was a large number of accidents at work, and infectious diseases due to poor sanitation in factory premises were common. The development of factory production has also led to the urbanization of the rural population. The share of the urban population in England in 1500 was 7%, and by 1800 this figure had already reached 29%, showing the greatest dynamics among European countries [2].

The mass gathering of people in industrial centers led to serious problems in the housing sector. People lived in unsuitable small premises. At the same time, the formation of the working class began, the segmentation of society into employers and workers took place.

A natural conflict of interest arose; the employers sought to produce as many products as possible with the lowest possible costs, while the employees sought to get the highest possible wages, to improve the quality of working conditions.

There are different approaches regarding the impact of the mass application of technologies, which formed the basis of the industrial revolution, on the standard of living of the population. For example, Joel Mokyr argues that the growth in the standard of living before 1850 was quite low and the improvement of the living conditions of the working class was slow and late [9]. On the contrary, according to Gary Hawke, the level of consumption was constantly growing and the average incomes of the population were increasing [10]. The results of the study by R.M. Hartwell, which are very convincing, indicate an increase in the average per capita income, a fall in prices, and an increase in consumption [3]. Thus, the real incomes of the majority of workers grew in the period of 1800-1850. Despite the above, the following circumstance is important. The growth of the standard of living of wide sections of the population was completely disproportionate to the overall economic success associated with technological transformation [11]. The main beneficiaries of the technological revolution were the capital owners.

II

During the period under review, the principle of "laissez-faire" prevailed in England and in European countries, in accordance with which any intervention by the state in the naturally developing economic relations was rejected. Such an approach assumed a superficial regulation of market relations, i.e. the absence of serious legal restrictions in the field of economic activity. Therefore, it was the most favorable for the receipt of the maximum economic benefits from the use of new technologies.

For example, until the end of the 18th century, the Settlement Act 1662 operated in England, which gave the authorities the right to expel anyone in a foreign parish (community, administrative unit) so that such a person would not be a burden on the corresponding parish. Such a restriction on the freedom of movement of labor in the conditions of the flourishing of economic relations and factory production did not benefit either the workers themselves or even the property owners. The worker could not go to the market in which he could sell his work in the most profitable way, and the industrialist developed his enterprise against this law, violating it and using the labor of migrants. Due to the emergence of a mass request from the part of employers and employees, this law was repealed [12].

The working masses, due to a large number of disagreements with employers, at the turn of the 18th century often joined working unions and held public events to protect their social rights. However, the state did not attempt to resolve potentially conflicting social relations with adequate legal instruments. Instead, acting in accordance with the logic of the principle of non-interference in economic relations, the law [13] prohibiting the organization of labor unions and further worsening of the disenfranchised position of workers was adopted. It seems that most of the negative social consequences of the introduction of modern technology could be mitigated by legislative methods. As was noted above, at first political power was on the side of entrepreneurs, who were free to organize work in their enterprises at their own discretion. At the same time, the state gradually began to understand the inevitability of taking measures aimed at alleviating social tensions among different sectors of society. This circumstance led to the emergence of social legislation, which later served as an example for many European countries. In particular, in the first half of the 19th century, regulatory legal acts began to be adopted, giving workers a number of social rights. In 1802, the most important Health and Morals of Apprentices Act was adopted, which established requirements for employers: to improve the quality of working conditions, provide clothing for minors, follow safety instructions for minors, limit working hours for minors, and conduct medical inspection of workers and to prevent the spread of infections in the workplace [14]. The 1819 law on cotton mills, the 1833 law on mills, the 1844 law on mills, the 1847 law on shortening the working day for women and adolescents, the 1850 law on mills were also adopted. A new model of legal regulation, which began with the protection of textile workers, on all branches of the manufacturing industry in which manual labor was involved.

B. The Second Industrial Revolution: the experience of Germany

I

The second industrial revolution is a natural continuation of the first, since all technological advances were based on previous inventions. It took place approximately in 1870-1930. In contrast to the first industrial revolution, the technology of the second one arose mainly as a result of research and development [15]. At this time, innovations had the most important influence on the development of economic and other relations in advanced countries, on the basis of which mass production and use of internal combustion engines, automobiles, railway transport, telegraph, and radio became possible. The famous historian of economics David Landis notes that a number of technological innovations were the prerequisites for all the significant changes in production inherent in that time. First, the development of new methods of production of modern and already known materials. First of all, it refers to the invention of an inexpensive method for the production of high-grade steel, as well as numerous innovations in the chemical industry. Secondly, it refers to new sources of energy, in particular, internal combustion engines and fuel, electricity. Third, it refers to the mechanization and division of labor. The growth of large industrial enterprises stimulated scientific research in order to find the most optimal organization of labor [16]. As a result, a well-known system arose, called "Taylorism," which made a huge contribution to improving the efficiency of the production of consumer goods. Also, an important innovation was the use of conveyor production, which led to the unprecedented development of mechanical engineering.

The above technologies were initially used in individual industries, but subsequently, they were widely distributed in all sectors of the economy.

At the same time, the changes that have occurred in production technologies have entailed not revolutionary, but evolutionary changes in the social structure. They led to the rapid development of trends that began during the first industrial revolution. By the end of the 19th century, industrialization was actively pursued in Great Britain, Germany, France, and Belgium, as well as in some other countries. The share of employment in the industrial sector dynamically increased [17], the population massively migrated to the cities, the number of large factories grew and labor productivity increased. The above processes led to an increase in the class of hired workers employed in industrial enterprises. It was becoming more and more difficult to restrain the pressure of the working class, which required improving their working conditions and wage increases. Social tensions led to constant clashes between workers and property owners and government officials.

II

The experience of Germany should be considered as an example of the state response to changes in social relations. One of the reasons for this choice is that it was Germany that most successfully applied the technology of the second industrial revolution in terms of economic growth [16]. However, the level of workers' wages remained catastrophically low, just enough not to die literally starving. The level of social inequality in Germany is well illustrated by the wage differentials among different sectors of society. Thus, in 1876, a machinist living in Munich received about 270 marks a year, a typical elementary school teacher – about 1600 marks, and a lawyer engaged in private practice had about 34,000 marks a year [18]. For these reasons, left-wing ideas were extremely popular at that time, the spirit of revolution wandered throughout Europe. If in 1875 there were about 25,000 workers organized in labor unions in Germany, by 1877-1878, this figure had reached 47,000 [18]. Fearing revolutionary-minded labor organizations, social reforms began on the initiative of Chancellor Bismarck in the united German Empire. As part of its implementation, a social insurance system was established, based on a number of laws. In particular, the Reichstag issued the first three laws: on sickness insurance (1883); on insurance of accidents (1884); on disability and old age insurance (1889). The described practical measures were based on the understanding that in order to adequately respond to rapidly changing social relations, it was necessary to modify the approach to the distribution of national wealth. The theoretical foundation of these reforms was the theory of the welfare state, the founder of which was the public figure Lorenz von Stein. This theory was influenced by the philosophy of G. Hegel, the French socialist doctrines, the English economic theory. It was Lorenz von Stein who introduced the notion of a "social welfare state" [19]. Analyzing the political demands of the working class in France, and based on the provisions of the Declaration of the Rights of Man and the Citizen of 1789, on the principles and norms enshrined in the French Constitution, adopted on September 3, 1791, L.F. Stein concluded that the coexistence of different classes of society should be based on the principle of social solidarity.

C. The third technological (informational) revolution

I

In the second half of the 20th century, the third technological revolution began, connected with the transition from mechanical and analog electronic devices to digital ones. Innovations have occurred in three main technological areas: microelectronics, computer technology, and telecommunications [1]. The proliferation of inventions of previous industrial revolutions was extremely limited by geographic factors and took a long time to cover a significant part of the world. Due to the emergence of an information and communication network that allows for instant processing and transfer of information, over the course of two decades, advanced technologies have spread to all leading countries. The created technologies themselves became a platform for the dissemination of knowledge around the world; information began to be perceived as a significant economic resource. A feature of this revolution is also the fact that these technologies have found deep and wide application in economic, political, social and cultural relations. The unprecedented rate of cheapening and simplification of the production of electronic computers and their components contributed to the rapid introduction of advanced technologies into the social practice. In particular, the manufacture of microchips using the plenary process led to a technological breakthrough. In just three years, semiconductor prices fell by 85%, and production increased by a factor of 20 over the next ten years [20]. For example, in England during the industrial revolution, it took 70 years (1780-1850) for the price of cotton fabrics to fall by 85% [21]. In the new economic paradigm, the most important factor in increasing labor productivity and competitiveness of business entities is their ability to create, process and effectively use information, including using automated systems. Moreover, the economy is beginning to acquire a global nature, since the main types of economic activity, such as production, consumption, and movement of goods and services, as well as their components (capital, labor, raw materials, management, information, technology, markets), are organized on a global scale.

Leading scientists suppose that at this time a revolutionary change in the whole of social life took place. So, D. Bell noted the formation of a post-industrial society, the distinctive features of which were the transition from the economy of production to the economy of services, the dominance of the professional and technical class, the central role of theoretical knowledge, technology planning, the creation of "intellectual technology" [22]. According to the well-known concept of the Three Waves by E. Toffler, this period is considered to be the Third Wave, which carries with it the inherent new pattern of life, based on a variety of renewable energy sources; on production methods that make most factory assembly lines unnecessary; on new non-nuclear families; on the new structure,

which can be called "electronic cottage"; on radically changed schools and associations of the future. If the second wave gave rise to a mass society, then the third wave de-massified it, shifting the entire social system to a higher level of diversity and complexity [23].

II

The end of the 20th – the beginning of the 21st century will mark the formation of the industry of information legislation. The fundamental source of all rights arising in the information age is the right to information, enshrined in Article 19 of the Universal Declaration of Human Rights, according to which "everyone has the right to freedom of opinion and expression; this right includes the freedom to freely adhere to one's convictions and the freedom to seek, receive and impart information and ideas by any means and regardless of frontiers" [24]. An important international act in this field is the "Convention on the Protection of Individuals with regard to the Automated Processing of Personal Data" adopted by the Council of Europe in 1981 [25], the purpose of which is to ensure for every individual, regardless of his citizenship or residence, respect for his rights and fundamental freedoms, and in particular his right to privacy, regarding the automated processing of personal data relating to him. In 2000, the G8 member countries adopted the Okinawa Charter of the Global Information Society in 2000 [26], which is a response to the challenges of the 21st century and developing information technologies. Also, in 2001, the European Convention on Computer Crime was concluded [27]. In parallel with this, national acts were adopted that laid the foundation for the legal regulation of social relations related to information. Thus, in the USA, the Law on Administrative Procedure of 1946, the Law on Freedom of Information of 1966 (acting as amended by the Law on Freedom of Electronic Information of 1996), the Law on Privacy of 1974, the Law on Openness of the Government of 1976 were adopted. Similar laws have been adopted in other countries, for example, the 1970 Law of Norway on Freedom of Information, the French Law of 1978 on Access to Administrative Documents, the Danish Law of 1985 on Access to Administrative Documents, the Law of 1978 " On Government Information", New Zealand Law of 1982 "On Official Information", the Law of France of 1978 "On computer science, card files and freedoms", the Law of Luxembourg of 1979 "On the use of nominative data in computer processing", etc. These documents laid the foundations of the modern approach to regulation of information relations, especially in terms of information rights and individual freedoms.

V. DISCUSSION

A. The fourth technological revolution

Developed societies are currently experiencing the beginning of the fourth technological revolution. Time will show what technologies (technical means) will be the most widely used [4]. However, with a certain degree of certainty, it can be argued that artificial cognitive systems, cyber-physical systems, as well as the systems with their interrelationship, are directly related to the ongoing revolutionary changes. The effective use of digital technologies will contribute to economic and political development, which can lead to a significant increase in the standard of living of citizens. Their widespread introduction into public life will lead not only to the transformation of all spheres of human activity but also to the emergence of unprecedented new ways of human interaction with technical means. Potentially possible ways of such interaction can be divided into three categories. The first category includes the cases when a technical means is endowed with "strong artificial intelligence" and is capable of being a full-fledged subject of social relations on a par with a person, the interaction of a person with such a subject can be called coexistence. The interaction of a person with a technical means endowed with weak artificial intelligence, whose behavior is subordinated to human will and the satisfaction of human individual needs, can be called the interconnection of a person with a technical means. The third way of interaction should be defined as the merger of a human with a technical means of production, since it means the association of a biological subject with separate digital and mechanical elements (cyborgs). With such methods of human interaction with technical means as coexistence and interconnection, one of the most pressing issues requiring resolution is how to create an atmosphere of trust in them in society. In particular, so that a person could easily delegate the solution of tasks to automated systems in such sensitive areas as health care, transport, the labor market, finance, and education. Successful end-to-end implementation of technologies in these areas of activity will allow extracting unprecedented benefits from this to improve the living standards of citizens. At the same time, these methods of interaction contain a huge amount of potential risks that can lead to negative consequences. For example, the topic of sharp discussions in recent years is the limits of the use of robots for medical purposes, the admission of unmanned vehicles to public roads, the massive replacement of human labor by automated systems. In particular, the scientists from the University of Oxford, having studied the probability of automating 702 professions in the United States, concluded that 47% of them were in the high-risk zone of automation [28].

No less relevant are the problems of legal regulation of the relations arising from the merger of biological subjects with technical means. The integration of digital and mechanical elements with biological organisms in the medium term can lead not only to a significant extension of a person's life but also to improve his physiological capabilities, cognitive abilities, significantly increase the speed of information search and analysis, change memory performance. It is obvious that the most advanced technologies will have high cost and will become available only at the level of states, corporations, as well as individual segments of the population. Thus, in several decades, an insurmountable differentiation in the abilities, duration, and quality of life between individuals can arise. In turn, the majority of modern states that pursue policies aimed at ensuring equal conditions for citizens will be forced to substantially adjust the legislation in order to prevent excessive social inequality.

Legal regulation of social relations arising in the era of the fourth industrial revolution is in its infancy. The most perfect legal regulation is observed in the countries with relatively long experience of the use of automated machines. These include the United States of America, South Korea, China, Japan, and some European countries.

Positive experience has been gained at the level of the European Union. For example, the Guidelines on Regulating Robotics [29], compiled as part of the Robolaw project, is of great scientific and applied value. It attempts to fundamentally study the ethical and legal problems arising from the use of robotic systems, in order to develop the recommendations to European and national public institutions for their resolution. In 2017, the European Parliament adopted the Resolution "Civil Law Rules on Robotics" [30], which includes a number of universal recommendations to European countries on the regulation of robotics. Moreover, in 2018, 25 member states of the European Union signed the Declaration on Cooperation in the Field of Artificial Intelligence [31]. Also, the General Data Protection Regulation (GDPR) [32] entered into force in the European Union in 2018.

At the national level, a significant number of various strategic and programmatic documents have been adopted. At the same time, a common feature of the state regulation of these issues is the lack of comprehensive regulatory legal acts [33]. The adopted acts are devoted to individual aspects; in particular, the use of artificial intelligence and robotics is reflected in the legislation of South Korea [34], China [35], Japan [36], the United Arab Emirates [37], and Great Britain [38]. Some issues related to the operation of unmanned vehicles have been settled in Germany [39] and Estonia [40]; in the UK, a draft law is under development [41]. A law, regulating the use of chatbots, has been adopted in the state of California [42].

VI. CONCLUSION

Thus, to minimize all the risks inherent in the technologies of the fourth industrial revolution, timely development of a balanced legal regulation is required, able to avoid negative consequences and contribute to the large-scale introduction of appropriate technical means into public life. One of the measures aimed at achieving this goal is the development and scientific substantiation of legal approaches for the legal regulation of the considered ways of human interaction with technical means. The reported study was funded by RFBR according to the research project No. 18-29-16193. The study was carried out with the financial support of the Russian Foundation for Basic Research in the framework of the research project No. 18-29-16193 mk "Theoretical Foundations of Building Legal Models of Human Interaction with Cyber-Physical, Cyberbiological and Artificial Cognitive Systems".

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