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CRIMINOLOGICAL CLASSIFICATION OF ROBOTS: RISK-BASED APPROACH

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The subject of the research is key criminal risks in robotics.
The purpose of the article is to confirm or disprove the hypothesis that key criminal risks of using robots may be identified and classified. The author dares to describe the key aspects of the application of risk-based approach in the assessment of robotic activities, identify the key risks of using robots, give a criminological classification.
The methodology includes a formal logical method, systematic approach, formal legal interpretation of legal acts and academic literature, SWOT analysis.
The main results of the study. The author applies the main provisions of criminal riskology when assessing encroachments involving robots. Key risks and challenges when using robots are identified. The severity of the consequences of harm caused by using robots (from minor to critical risk) is assessed and a matrix of the probability of its occurrence is provided. The author's criminological classification of robots is based on the risk-based approach and is substantiated on two grounds. The first one is the category of public danger and the second is the potential severity of the consequences of harm caused by robots. The causal complex that can lead to criminal risks in robotics is identified. The grounds of such risks are divided into those related to the mechanical subsystem of robots, digital subsystem of robots and power supply subsystem of robots.
Conclusions. The risk-based approach is the most progressive and effective basis for regulating the criminal relations in robotics. The author demonstrates the existence of real risks to the peace and security of mankind, life and health of people, objects of wildlife, non-living material objects from the use of robots. It is necessary to recognize robotics as source of increased potential criminal danger and to adopt appropriate regulation as soon as possible. The necessity and expediency of applying a risk-based approach to robotics is theoretically substantiated, and the characteristics of robots that are important in assessing the criminal potential of their exploitation are evaluated. The conclusions and recommendations of this paper may become a basis for the implementation of the risk-based approach in legal regulation of robotics. The risk matrix presented in the article can be used to establish a framework for regulatory impact on robotics, assess the consequences of potential harm and minimize it.

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1. Introduction

Humanity is on the threshold of an era when the expansion of the horizons of the use of artificial intelligence gives rise to a new industrial revolution. Its application inevitably leads to the problem of ethical choice, which is widely covered in domestic and foreign science [1-10]. The development of artificial intelligence also generates a lot of purely legal issues [11-22] that require surgical intervention [23, p. 564].

In the modern world, robots and artificial intelligence have become an integral component of human life [24-29], they improve our daily lives [30, pp. 373]. Machines powered by artificial intelligence are increasingly becoming intermediaries in our social, cultural, economic, and political interactions [31, pp. 477]. The consequences of the emergence and development of intelligent robots for social relations and society as a whole are discussed not only in connection with the risks and benefits of automation, but also in the context of the threat of losing control over self-developing autonomous artificial intelligence [32, p.216].

The use of robots in the performance of routine processes and operational activities, which previously only a person was capable of, not only greatly facilitated hard work, determined the vector for reorienting the resources of humanity to perform more creative work, but also raised a number of global issues for the world community. First of all, due to the rapid development of robotics and artificial intelligence and the delegation of functionality to them in areas that are very important and extremely "sensitive" for humanity, both from the point of view of ethics and law. Understanding the behavior of artificial intelligence systems is necessary for our ability to control their actions, extract benefits from them, and minimize their harm [31, pp. 477].

We should support the opinion of A. Turchin and D. Denkenberger, who believe that artificial intelligence can pose a global catastrophic risk at various stages of its evolution. Today, no solution can cover all the risks associated with the use of robotics and artificial intelligence [33, pp. 147].

As M. M. Babaev rightly notes, "economic, technical, technological, informational, demographic, environmental and other innovations-all of them, as is well known, had and have at the same time both creative and destructive potential. The resulting complication of people's living conditions has exacerbated the system of interpersonal relations, turned out to be an increasingly "saturated" environment of tension and endless ethnic, religious and other social conflicts. Ultimately, modern society (including Russia) has turned into a "society of universal risk", in other words, a society that produces high technological and social risks in all spheres of its life – economic, political, and social" [34, p.105].

Today , the expert community, large technology companies engaged in the development of digital technologies , and international organizations are engaged in the development of ethical standards for robotics and systems with artificial intelligence . The development of ethical robots is one of the most difficult tasks in the field of artificial intelligence [35, pp. 24]. Artificial intelligence has been the subject of extensive and controversial discussions [36, pp. 1]. The ethical debate raises two main problems: the first is a conceptual one, related to the lack of agreement on the definition of artificial intelligence; the second is functional, resulting from a different attitude to technology and law [37, pp. 1].

The issue of legal regulation of artificial intelligence and robotics is at the top of the agenda of the UN, G20, UNESCO, the European Union and the OECD. More than 60 countries around the world have adopted or are developing concepts for the legal regulation and development of AI and robotics. At the same time, all of them note the expediency of an early assessment of the risks of introducing robotics and artificial intelligence, and minimizing their consequences .

The existing technological standards of robotics focus on the physical interaction of humans and robots, that is, on preventing harm [38, pp. 504] and minimizing risks [39, pp. 30]. It is extremely important that the risk assessment is carried out not only taking into account the robot manufacturer's own interests, but also from the point of view of other stakeholders [40, pp. 411]. The development of innovative solutions for risk management is of

strategic importance, since the robot manufacturer is actually responsible for all the harm caused as a result of the use of its product [41, pp. 202], including for the mistakes of robots based on artificial intelligence [42, pp. 334].

Risks are a complex social phenomenon, whose roots are in the nature of society, the state and the individual [43, p. 11]. Risk, which is a universal category of socially significant behavior, in criminal law should be considered comprehensively, taking into account the characteristics of all types of risky behavior. It is the basis of any activity, it can have a positive orientation as a way to relieve social tension and achieve socially useful goals, and a negative one - in the form of a threat of causing real harm to protected interests [44, p. 3]. The risks combine challenges and threats to the existing legal order and its possible changes in the conditions of robotization in a striking way [45, p. 544].

In turn, if we think about the criminal law and criminological realities, the risks of modern society are the background against which they unfold, and the factor that determines the main directions of the country's criminal policy. The area of these risks is our entire reality, all areas of human activity, without exception, that either consciously generates or allows for the possibility of certain dangerous and harmful consequences. Not only taking into account the real state, but also predictive assessment of the future, including risk assessment, should be considered as an indispensable component of intellectual support for competent criminal policy and, in particular, criminology [34, p. 104].

We support V. N. Voronin's proposal to introduce a new term "criminal-legal risk" into the mechanism of legal regulation and to assess the risks of all digital technologies based on the newly developed concept by establishing their potential danger to society [46, p. 76].

Riskology, and its particular manifestation – criminal riskology-is a fairly new phenomenon and little studied in Russian criminology, criminal policy and in its component part – preventive policy [47, p. 137]. The lack of a serious basis of criminological research devoted to the study of the concept of risk creates significant obstacles to improving the effectiveness of criminal law regulation.

A criminological study of the risks of using robotics and artificial intelligence is a fairly new phenomenon not only for domestic science, but also for the world.

This study is one of the first attempts to apply a risk-based approach to the field of robotics, to identify key criminal risks, on the basis of which a risk matrix is created.

2. Theoretical justification of the risk-based approach to robotics

The study of the key aspects of the application of the risk-based approach to robotics is impossible without understanding the key concept – risk. In this aspect, we fully agree with the opinion of M. M. Babaev and Yu. E. Pudovochkin that, "in the context of criminal policy and criminology, this formula should sound like this: risk is a possible criminogenic danger" [47, p. 138].

The possible danger (risk) and the actual danger are different from each other: the first is a potential, unrealized, but real, that is, existing, threat. The actual danger is the realized risk. In fact, the latter should be considered as a direct threat to the values protected by law, standing "one step away" from the event (fact), which is usually called socially dangerous and react to it accordingly in the framework of solving the problems of criminalization. Or a step away from an act that has already been recognized as a crime [34, p. 106].

In the context of legal relations involving robots, there are increasingly studies devoted to the analysis of harm caused by the latter and the assessment of the legal consequences of this harm within the framework of existing criminal law norms.

For example, Gracheva Y. V., and A. A. Aramov in the work [48] indicate that robots today can become full perpetrators of some crimes, such as:

– a terrorist act (article 205 of the criminal code), which can be expressed as the bombing, arson, poisoning the water supply, the loss of life of people with the use of robotics;

- vandalism (Article 214 of the Criminal Code of the Russian Federation): it is easy to imagine the use of a drone carrying a capsule with paint and dropping it on a building or structure to desecrate

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them;

- rendering life-support facilities unusable (Article 215.2 of the Criminal Code of the Russian Federation) by destroying, damaging or otherwise rendering them unusable using robots. Committing these actions out of selfish or hooligan motives is qualified under Article 215.2 of the Criminal Code of the Russian Federation; in the absence of these motives, but if there is a goal to undermine the economic security and defense of the Russian Federation – under Article 282 of the Criminal Code of the Russian Federation;

- illegal entry into an underground or underwater object protected in accordance with the legislation of the Russian Federation on departmental or state protection, using robotics, including drones (Article 215.4 of the Criminal Code of the Russian Federation);

- theft of nuclear materials or radioactive substances by using robotics to illegally enter a room or storage facility and take possession of the subject of a crime (Article 221 of the Criminal Code of the Russian Federation);

- illegal acquisition, transfer, sale, theft of weapons, their main parts, ammunition, explosives, explosive devices (Articles 222, 222.1, 226 of the Criminal Code of the Russian Federation), as well as their illegal movement across the customs border of the Customs Union within the framework of the EurAsEC or the state border of the Russian Federation by the member states of the Customs Union within the framework of the EurAsEC (Article 226.1 of the Criminal Code of the Russian Federation) using robotics, especially drones;

– the attack on a sea or river vessel for the purposes of taking someone else's property, committed with application of violence or with threat of its application through the use of robotics, including drones (article 227 of the criminal code) [48, c. 173].

V. S. Ovchinsky complains about the underestimation of the dangers of using robotics terrorists and extremists.

The researchers note that the advantages of using robotics to commit crimes are obvious:

first, the possibility of their use in hazardous areas, including biologically dangerous ones;

secondly, the physical safety of the person who uses these technologies to commit a crime, since they are usually far from the place where they are used, they have no fear of being discovered, injured or killed, which psychologically makes it easier to make decisions related to causing harm;

third, it is difficult to identify the attacker based on the robotics used [48, p.173].

At the same time, I. N. Mosechkin believes that in the domestic criminal legislation today "there are no elements of crimes related to the commission of socially dangerous acts through the use of neural networks, artificial intelligence or artificial intelligence itself" [50, p. 463].

We agree with the opinion of European criminal law experts who believe that " persons who produce, program, sell and use robots should be criminally liable for a deliberate crime if they knowingly use a robot to harm others. A person who allows a self-learning robot to interact with people can anticipate that the robot will get out of control and cause harm. This fact alone can lead to liability for negligence" [51, pp. 412].

As robots become more autonomous, people will hold them much more responsible for wrongdoing [52, pp. 365]. The autonomous nature of robots creates problems of predictability and control, which can make legal regulation ineffective, especially if the robot poses a catastrophic risk [24, pp. 354], such as a combat robot.

Without going into the controversy regarding the applicability of these norms in the criminal legal assessment of acts involving robotics, we note that it is quite difficult to regulate the legal aspects involving robots in the absence of determining the level of risk that may be caused. However, such studies confirm that the criminogenic risks of using robotics are obvious and it is no longer possible to ignore their danger.

Meanwhile, criminal risks, due to their status as the initial "participant" in the determination process, are relatively inaccessible to the direct application of the most acute means of influence available to criminal policy and, in particular, criminal law: there is no crime and no criminal [47, p.143] (at least for now).

As applied to the field of robotics, this circumstance is also due to the relative novelty of

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the relations under consideration.

3. Criminological classification of robots from the perspective of a risk-based approach

The analysis of the special scientific literature devoted to robotics shows that there are a significant number of classifications of robots depending on the purpose and the class of tasks to be solved, etc. [53-58] Meanwhile, for the purposes of this study, we focused on the criteria that are important in assessing the criminal potential. Based on the analysis, we have developed a detailed classification of robots that are important in assessing the criminal potential.

The current literature on risk management is replete with various approaches and risk classification constructs. However, a generally accepted and at the same time comprehensive classification of risks has not yet been developed, which is explained by their diversity, as well as the emergence of new types [59, p.177]. This is also true for criminological classifications. The systematization and classification of modern criminological knowledge and ideas about them is multidimensional and multi-faceted. Their criminological grouping can be made on various grounds [60, p. 26].

The approach based on the criteria of the content of structural risk characteristics, such as danger, risk exposure, vulnerability, and interaction with other risks, deserves the most attention when classifying criminological risks of using robotics.

Concretizing this approach, we identify two key bases that are the basis for risk assessment:

1. according to the severity of the consequences of harm caused by robots;

2. according to the degree of public danger.

Note that when classifying the severity of the consequences of harm caused by robots, due to the need to display both the magnitude of the risk and the combination of its components, we used the risk matrix (see below).

Let's describe its elements in more detail.

The conducted research shows that the following categories of risks can be distinguished by the severity of the consequences of harm caused by robots:

1. minor risk;

2. significant risk;

3. high risk;

4. critical risk.

Let's consider these types of risks in more detail.

1. Minor risk. With minor risks, the level of negative impact will be minimal and may entail minor negative consequences.

For example, this may be due to the work of chatbots that are able to access some digital information that is not of significant commercial or legal value, but is located in a closed field. The consequences of such risks can be corrected by the prompt application of legal or technical instruments.

However, it should be noted that if you do not take the necessary measures (software development, legal control, etc.), a minor risk may lead to more serious consequences in the future.

2. Significant risk. This type of risk may entail more severe consequences than the previous one. It is also preventable, like the previous one, but its consequences can cause more significant harm. In particular, this is due to failures in the software of robots that can cause discord in a particular life support system or professional activity, as well as the deliberate use of robots to gain access to any information that can seriously discredit the subject of a particular relationship or cause him financial, psychological or physical harm. This type of risk, in the event of its occurrence or the possibility of its occurrence, must be taken under control in order to avoid the consequences of its manifestation.

3. High risk. This type of risk can cause very serious consequences, especially when the creator of the software understands and is aware of their own actions. Most often, this is due to developments in the field of creating new weapons, military robots, as well as robots that can cause serious physical harm to objects of living or inanimate nature. This risk is often pre-determined, and its possible manifestation is known to both developers and users. Quite often, the concealment of these risks is associated with the desire of developers or customers to achieve a particular goal without taking into account the consequences of its achievement for the object or subject of influence. This type of risk must be taken into account in the legal field, since the consequences of such a risk can be fatal.

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4. Critical risk. Most often, critical risks are associated with a direct threat to objects of living and inanimate nature and directly to humanity. A critical risk also arises when an object with artificial intelligence gets out of human control and can lead to death and destruction. As an example, superintelligence is an autonomous combat system that can pose a potential danger. Hypothetically, as the result of high-tech research, superintelligence can gain consciousness, show hostility, and pose a threat to the peace and security of humanity. Overcoming critical risk involves significant, sometimes insurmountable difficulties. Accordingly, the prevention of this risk in the most possible ways should come to the fore. When a critical risk occurs, it is necessary to quickly make decisions to level it.

The second basis for criminological classification of robots from the point of view of a risk-based approach is the degree of public danger. In particular, robots can be positioned as:

1. Dangerous for the peace and security of mankind. Here we are talking about the possibility of total destruction by robots of both humanity and living and inanimate nature. Legal and physical control of a person is limited or absent;

2. Dangerous for the life and health of people. In particular, the danger lies in the possibility of robots encroaching on human health, attempted murder or its commission, the commission of terrorist acts, hostage-taking, local military conflicts, etc.;

3. Dangerous for wildlife objects. These may include various environmental disasters of a man-made nature involving robots, intentional or uncontrolled destruction of flora and fauna. Here it is necessary to point out the connection between the considered and the previous criteria, since harm to wildlife entails harm to humans, and this harm can be irreversible;

4. Dangerous for non-living material objects. This criterion covers encroachments on property, buildings, structures, structures, etc. Damage caused within the framework of this criterion can have significant financial consequences, as it can entail significant losses, in addition, damage can also be caused to objects of cultural significance, as well as objects of historical value, up to their loss.

The most catastrophic severity of the consequences of causing harm by robots can occur when using military robots (combat robots, lethal autonomous weapons, deadly autonomous weapons systems), since this category of objects under consideration is programmed, first of all, for aggressive actions, the use of force and causing destruction.

The high severity of the consequences in various degrees of public danger can be caused by different robots for different purposes: for example, space robots (as a type of military robots) can be quite dangerous for the peace and security of mankind, since the negative impact of such robots from space can cause irreparable damage to humanity and the planet in the event of an out-of-control human or as a result of a programmed technical solution of the latter.

Law enforcement robots can cause a high severity of consequences for the life and health of people, this may be due to certain commands that are embedded in the software at the creation stage and which can be directed, for example, to suppress demonstrations, mass riots. In addition, law enforcement robots, just like the military, are programmed to take aggressive actions against humans when necessary. For this reason, the exit of such robots out of control in the process of restoring public order can also have fatal consequences.

For wildlife objects, industrial robots can pose a high risk, and consequently, a high severity of consequences, since, performing the tasks assigned to them, such robots are deprived of the ability to analyze how high the level of environmental danger from their actions is. In this regard, the actions of industrial robots, for example, in the mining or forestry industries, can lead to an environmental disaster.

Rescue robots (as a type of law enforcement robots) can pose a high danger to non-living material objects, since the main task of such robots, laid down at the programming stage – is to save people. Accordingly, the efforts that are made in this case may have negative consequences, for example, for buildings or natural areas, if they are subjected to massive destruction in order to implement the task of saving people, since the choice of alternative

options in such extreme situations is the prerogative of a reasonable person.

The average severity of the consequences is characteristic of the harm that law enforcement robots can cause to the peace and security of humanity. For example, law enforcement robots can disrupt the functioning of critical and potentially dangerous objects when performing tasks assigned to them.

Industrial and medical robots can also cause harm to human life and health, the consequences of which can be attributed to the average. For example, a medical robot used for surgical intervention may perform inaccurate or erroneous actions, thereby causing harm to human life and health.

Household, educational, and scientific robots pose a low and insignificant risk to all the categories under consideration. The danger may be related to errors in the software, various technical failures in the work of robots, etc. These aspects may cause:

- a decrease in the speed of obtaining and processing scientific information and a decrease in the effectiveness of scientific research (research robot);

- causing light and moderate damage to health due to a malfunction of the robot (home robots);

- reduction of the number of jobs, inability to perform the assigned production task, failure to fulfill the production plan, violation of labor protection and safety regulations (industrial robots).

Thus, the above criminological classification of robots in the framework of the risk-based approach clearly demonstrates a direct correlation between the degree of public danger of robots and the severity of the consequences of the harm caused by them.

It should also be noted that a particular risk may arise, in general, for several main reasons related to the design features of robots.

1. Reasons related to the mechanical subsystem of robots:

- shortcomings of mechanisms (drives, motors, etc.) that were not identified at the stage of production (development) or were manifested during the operation of robots;

- the deliberate creation of undeclared capabilities of robot mechanisms in order to commit certain actions of an illegal nature.

2. Reasons related to the digital robot subsystem:

- software flaws (software vulnerabilities, random software errors) that were not identified at the development stage or were revealed during the operation of robots;

- deliberate programming (reprogramming) of robots to commit certain actions of an illegal nature (undeclared software features).

3. Reasons related to the robot power supply subsystem:

- shortcomings of the power elements (vulnerabilities of the power elements) that were not identified at the development stage or were manifested during the operation of robots;

- deliberate interference in the operation of the power elements of robots, aimed at committing certain illegal actions (violation of the rules of operation and safety standards for the power supply of robots).

4. Conclusions

The risk-based approach is the most progressive and effective basis for regulating the relations under consideration.

As part of our research, we have clearly demonstrated the existence of real risks to the peace and security of humanity, human life and health, objects of wildlife, non-living material objects from the use of robots. This leads to the need for early recognition of robots as sources of increased danger [61] or autonomous sources of increased danger [62, pp. 764] and the adoption of appropriate regulation.

Based on the system analysis, the necessity and expediency of applying a risk-based approach to robotics is theoretically justified, and the characteristics of robots that are important in assessing the criminal potential are evaluated.

As part of the study, the severity of the consequences of harm caused by robots (from minor to critical risk) is estimated, and a matrix is given for the probability of their occurrence, and the author's criminological classification of robots is developed on two grounds: by the degree of public danger and

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by the potential severity of the consequences of harm caused by robots.

The author also concludes that a particular risk may arise, in general, for several main reasons related to the design features of robots, and a typology of reasons depending on them is also developed.

It is also worth concluding that the conclusions and recommendations made in this paper can serve as a basis for the implementation of the risk-based approach laid down in the basis of the principles of regulating relations in the Russian Concept for the Development of regulating relations in the field of artificial intelligence and robotics technologies. In addition, it should be noted that the risk matrix presented in this paper can be used to create a framework for regulatory impact, assess the consequences of potential harm and minimize them.

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